# [illegible] and Macro Aspects [illegible] Supply

By

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# MICRO AND MACRO ASPECTS OF PUBLIC-GOODS SUPPLY

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This study considered two alternative methods of public goods supply. Public goods are widely thought to be provided suboptimally by private markets. Public goods are goods that enter two or more persons' utility functions. This characteristic and the related problem of concealed preferences are held responsible for this suboptimal supply. In contrast, there is no clear consensus on the level of public-goods supply when they are provided by government. Two models were developed in this study. The first was designed to demonstrate the characteristics of public-goods supply in private markets. The second was developed to demonstrate public-goods supply in a democracy.

It was necessary to examine the preference maps of individuals in order to understand their behavior when faced with private markets for public goods. Independent demand curves do not reflect the effect of one individual's purchases on the purchases of others. It was shown that when one individual purchases units of a public good, there is an income effect on other individuals whose utility the good enters. Consumers

have partial net demand curves for public goods which reflect these income effects for each level of purchase by other relevant consumers. But these conditional responses, taken alone, tell nothing about the actual level of provision that will occur when consumers enter the market. The partial net demand curves of two consumers were examined simultaneously to determine the result of their interaction. A locus of equilibrium quantities, one for each potential price, was derived. From this locus of points, a price-quantity relationship was developed which was called an individual net demand curve. Since consumers act independently, net total demand is the horizontal sum of individual net demand curves.

Independent total demand is the vertical sum of independent demand curves. The Pareto efficient level of provision occurs where independent total demand is equal to marginal cost, or price, with competitive markets. Net total demand intersects independent demand at one point. There is one price which will result in efficient allocation when consumers act independently -- the price that corresponds with this intersection. Higher prices will result in suboptimal provision, while lower prices will result in oversupply. The introduction of concealed preferences did not alter these results. However, at every price concealed preferences result in a lower level of provision than when true preferences are revealed.

The supply of public goods in a democracy was examined using a model which employed some restrictive assumptions. There were no parties, no legislatures, no limits on the number or types of votes that could be taken. A proportional tax structure was assumed. No significant costs of agreement were considered and unlimited bribery was allowed. A

"correct" budget was defined that included only those programs which provide positive net benefits to society. These programs should be extended to the point where marginal benefits equal marginal costs. The notion of "correctness" is based on the "compensation principle."

The study examined the budgets for three types of goods -- private goods, public goods, and semi-public goods. The budgets for private goods and semi-public goods were found to be too large. Coalitions have an incentive to extend these programs beyond the point where the marginal benefits to society equal marginal costs. Their incentive is to maximize their own benefits. In contrast, it was found that public goods will be provided at the "correct" level. Since the budget for private goods and semi-public goods is too large and since the budget for public goods will be the "correct" size, the total budget in a democracy will be too large.

# CHAPTER 1

## INTRODUCTION

The theory of public goods has its origins in the writings of authors as far back as the Middle Ages. Most of these writings were concerned with government taxation to support public services. There were two approaches to the theory of taxation.[1] The ability-to-pay approach contends that taxes should be determined by an individual's capacity to pay them. The benefit approach argues that individuals should be taxed according to the benefits they receive from public goods and services.

### Development of the Benefit Principle

Of the two principles, the benefit principle of taxation is most directly linked to modern public goods theory. Writers of the eighteenth and nineteenth centuries considered the benefit principle an equity approach rather than an efficiency approach. In fact, it was often difficult to distinguish between the benefit and ability-to-pay principles. Early proponents of both principles sometimes advocated taxation according to property, wealth, or some other reflection of ability-to-pay. However, since the function of the state was seen primarily as one of protection, an individual received benefits proportional to the amount of his property or wealth that was being protected (29, pp. 63-68).

[1] For a more extensive discussion of these approaches, see Richard A. Musgrave's The Theory of Public Finance (29, pp. 61-115).

Advances in subjective-value theory caused an important departure in benefit theory towards the end of the nineteenth century. Taxes came to be considered as payments for benefits received from government services much in the way prices are viewed as payments for goods provided in private markets. The benefit approach to taxation came to be viewed more as a requirement for efficiency in the allocation of resources than as a standard of equity (29, pp. 68-70). Taxpayers should pay taxes commensurate with their subjective evaluations of the benefits they receive from public services. Pantaleoni argued that the tax and expenditure sides of the budget should be determined simultaneously in order to insure that the benefits from public expenditures justify the costs (32).

The Voluntary-Exchange Approach

The next advance in public goods theory originated in the voluntary exchange model developed by Lindahl and later by Bowen (25; 4). Lindahl established that the price a taxpayer must pay should be set so that he realizes maximum benefits from public services. He also demonstrated a mechanism that would bring about the correct prices on a voluntary basis.

Lindahl expressed individual demand curves for public services in terms of the percentage of the total cost of the service that each consumer would be willing to pay for each level of provision. The equilibrium level of output occurred at the point where the sum of the contributions his two taxpayers were willing to provide equaled 100 percent of the total cost. For greater levels of output the combined contributions of the two individuals would be less than 100 percent and output would have to be reduced. For levels of output less than the equilibrium level taxpayers would be willing to contribute more than

100 percent of total costs and would vote for a greater quantity. At the equilibrium level each taxpayer would be charged the percentage of total costs that he had revealed he was willing to contribute.

The voluntary-exchange model is a partial equilibrium model. Taxpayer desires for public services are considered independently of their desires for private wants. Moreover, the model assumes that taxpayers will reveal their true preferences. Both of these objections are dealt with in later work by Paul A. Samuelson.

## The Samuelson Model

In his 1954 and 1955 papers (34, 35), Samuelson dealt with the problem of public goods supply in a general equilibrium context. He derived the conditions for "Pareto optimality"[2] by simultaneously considering both public and private goods. This work by Samuelson and some later modifications constitute the present state of public-goods theory.

In order to derive the conditions for Pareto efficiency Samuelson posited a world of private goods and social goods.[3] He assumed an initial distribution of private goods between the two consumers in that world. Consumption of a unit of a private good by one individual precludes the possibility of its consumption, at the same time, by other individuals. Consumption of a unit of a public good does not preclude the possibility of its simultaneous consumption by others (34, p. 387). Holding the utility of one individual constant, Samuelson then asked what conditions

[2]Pareto optimality, or efficiency, is defined as that state of affairs where no reallocation of resources can improve the welfare of any one individual without reducing the welfare of at least one other individual.

[3]Public good is the term most commonly used to denote a Samuelson social good.

would lead to maximum utility for the other individual. He found that maximum at the point where the sum of the marginal rates of substitution of the individuals equaled the marginal cost of producing the public good (35, p. 352).

By changing the initial distribution of private goods between the two individuals and again holding the utility of one man constant while maximizing the utility of the other, Samuelson found an infinity of possible final allocations of goods that were Pareto optimal. No one of these distributions could be deemed better than any of the others on the grounds of allocative efficiency. A single "best" solution to the infinity of efficient solutions cannot be determined without reference to a social welfare function. A social welfare function is an ordering of all the possible states of the world based on ethical judgments beyond the scope of economic science (34, p. 353).

## The Problem of Concealed Preferences

At first glance the infinity of efficient points held out by Samuelson seems encouraging. Optimality in the provision of public and private goods is all around us. But as Samuelson points out (34, pp. 388-389), and as Wicksell sensed before him (45), the attainment of an efficient point is a more difficult matter than the description of its characteristics.

As pointed out above, the consumption of a unit of a private good by an individual precludes consumption of that unit, at the same time, by other individuals. Assuming perfect competition, each individual will purchase units of a private good up to the point where the costs of their purchase exceed the benefits received. The normal, utility-maximizing

behavior of individuals will lead to efficiency in the provision of private goods.

The distinguishing characteristic of a public good is that the consumption of a unit by one individual does not preclude the simultaneous consumption of that unit by others. A classic example of a public good is a lighthouse. All fishermen who come within range of the lighthouse derive benefits from its beams.[4] It would be a costly matter to devise methods of directing the beams exclusively to the fishermen who share in the cost of building and maintaining the lighthouse. The optimal arrangement would be for all of the fishermen to get together, determine what size lighthouse would be best in terms of the Samuelson conditions for efficiency, and then share in the costs according to their marginal rates of substitution.

But perfectly competitive markets will not guarantee Pareto efficiency as they do in the case of private goods. Each fisherman will have an incentive to conceal his preferences for the lighthouse. He will recognize the possibility of enjoying the beams from the lighthouse without sharing in the costs. Since the effect of an individual fisherman's contribution on the size and quality of the lighthouse will be negligible, he will conceal his preferences when he realizes that his contributions to its costs will be determined by the preferences he reveals.[5] If some or all of the fishermen conceal their preferences,

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[4] Buchanan's description of the range of collective goods is enlightening (7, pp. 23-27).

[5] Even if those who refuse to contribute can be excluded from the benefits of the lighthouse, and if benefits are limited to those who reveal their true preferences, Pareto optimality will not be reached. Pareto optimality requires that the sum of the marginal rates of substitution of all potential beneficiaries equal marginal costs.

Pareto optimality will not be reached. Efficiency in the case of public goods is a far more elusive goal than in the case of private goods, and nihilism about the provision of public goods is implied.

## Nihilism About Economics

Samuelson originally intended his public goods-private goods model to be a polar one. His 1954 definition required that a public good enter the utility of all individuals. The public goods phenomenon was considered to include relatively few, although important, goods. The difficulty in achieving efficiency in the provision of public goods was serious, but most goods were clustered at the private goods pole where efficiency could be attained by competitive markets.

In 1966, Samuelson dropped his requirement that public goods enter the utility of all individuals. "A public good is one that enters two or more persons' utility" (36, p. 105) Instead of a polar model with a continuum in between, we are left "with a knife-edge pole of the private-good case, and with all the rest of the world in the public-good domain."

If the problem of concealed preferences frustrates efforts to achieve Pareto efficiency in the allocation of public goods and if all but a "knife-edge of reality" falls in the domain of public goods, then nihilism is indicated about most of economics, rather than only public finance.

This study examines two methods of public-goods supply. A model is developed that illustrates the actions of consumers when public-goods supply is determined in private markets. In addition, a model which illustrates the level at which a democracy will provide public goods is developed. It is important to examine both methods of provision because, in fact, public goods are provided in both the public and private sectors.

The model that illustrates provision in the private sector is a variation of a net demand curve model developed by Milton Z. Kafoglis (22). It demonstrates that purchases of a public good by one individual exert substantial income effects on other individuals. Net demand curves are derived that reflect the purchases that consumers will make in the presence of these income effects. These net demand curves are developed for the case when true preferences are revealed, as well as for the case when preferences are concealed. The level of public-goods supply that results is compared with the Pareto-efficient level. It is found that the level of public-goods supply may be greater than optimal, less than optimal, or optimal, depending on the preference maps of the relevant individuals and on the current price of the good. These results are compared with those of competing models.

The model for public-goods supply in a democracy is an extension of one developed by Davis and Mayer (14) It demonstrates certain aspects of budget size in a pure democracy. It is a restrictive model; there are no parties or legislatures; each citizen has an opportunity to vote on every issue. A concept of "correct" budget size is defined that goes beyond the requirements of Pareto optimality. The budget that emerges from the democratic process is compared with the correct budget size. It is found that the budget in a democracy will be too large. This result is compared with those developed in competing models.

This study does not resolve the problem of revealed preferences. It does not show the way to optimal public goods provision. It does demonstrate some important aspects of public-goods supply in the private and public sectors. While the models developed employ some restrictive assumptions, it is important to know the characteristics of the theoretical world if insights into the real world are to follow.

## CHAPTER 2

## THE PRIVATE SUPPLY OF PUBLIC GOODS

In 1958, Francis M. Bator classified types of market failure according to their causes. Essentially, markets fail to achieve Paretian efficiency despite the existence of the usual competitive assumptions because of (1) Ownership Externalities, (2) Technical Externalities, and (3) Public Good Externalities (1, p. 363). Ownership externality is the type discussed by Meade (26) where factor owners are unable to enforce their property rights. Thus, apple blossom owners receive no payment for the nectar they provide to producers of bees and underproduction of nectar results. Technical externality occurs when indivisibilities cause nonconvexities and production at some nonoptimal point, or when increasing returns to scale cause the breakdown of competition. Public-good externalities exist when "each individual's consumption of a good leads to no subtractions from any other individual's consumption of that good" (34, p. 387). This is Samuelson's original definition of a public good which was discussed in Chapter 1.

Recently, both Samuelson and Musheman have come to view both ownership externalities and public-good externalities as special cases involving interdependencies of consumption or production. Musheman includes both phenomena under the general heading of externality (11). Samuelson includes them in his latest definition of public goods (35). Both agree that private markets may fail to bring about an efficient

allocation in the presence of a good that enters at least two persons' utility.

If the market fails to provide public goods efficiently then there is reason for the exploration of alternative methods of provision. This is not to say that market failure is prima facie evidence of the need for an alternative method of provision. Indeed, alternative methods of provision may lead to some "worse" allocation than the market result. The point is, however, that market failure is sufficient justification for "social concern and scrutiny of the outcome; but that does not necessarily imply outright state ownership or in every case public regulation" (39).

Opinion is not unanimous concerning the ability of the market to provide public goods adequately. In 1964, A M Sharp and D R Escarraz (42, pp. 134-135) argued that the market will provide public goods at the optimal level. In the process they criticized the conventional conclusion that an inefficient allocation of resources will result because rational consumers will conceal their preferences. They arrived at their conclusion through a detailed analysis of consumer behavior when consumers are confronted with a market for public goods.

Mancur Olson, using a somewhat similar approach, remakes the more conventional conclusion that the provision of public goods by a private market will be less than optimal (31, p. 28). The conflict between the Olson and Sharp-Escarraz results is an important one. If the market will insure a Pareto-efficient allocation of public goods then there is no justification, on efficiency grounds, for social concern. On the other hand, if the market provides a less than optimal allocation of public goods, then the examination of alternative institutional arrangements for their provision is called for.

The purpose of this chapter is to present a model that will correctly illustrate the private supply of public goods. It will be demonstrated that the private provision of public goods may or may not result in an optimal allocation. Private provision may result in a public good being underprovided, overprovided, or optimally provided depending on the market price for the good and the preference maps of the relevant individuals. Chapter 3 will examine the Sharp-Escarraz and Olson models to discover what may have led them to their different conclusions.

## The Model

The analyses of both Olson and Sharp-Escarraz rely exclusively on the independent demand curves of individuals for public goods. Sharp and Escarraz are misled into thinking an individual faces a zero price once he is provided with some quantity of a public good at no cost. Olson's reliance on independent demand curves leads him to ignore the income effect on one individual of another individual's purchase of a public good. It is necessary to develop a better tool for the analysis of individual behavior if correct results are to be obtained.

Milton Z. Kafoglis has formulated a model for deriving "net" demand curves. It is based on the actions of individuals in group situations (22, pp. 33-38). The upshot of Kafoglis's analysis is that there are net demand curves which result when interdependencies in consumption exist. If one individual's consumption of a good can lead to enjoyment by another individual, the latter's demand for that good will be affected. He will have a "net" demand curve which reflects the enjoyment he receives as a result of the first individual's purchases of the good.

Kafoglis's model is concerned chiefly with the kind of good where one individual's consumption may cause a shift in the preferences of another. A possible application of his model that he mentions is conspicuous consumption (22, p. 38). This chapter is concerned with the situation where one individual's consumption affects another's utility function, but where no shifting of indifference curves occurs. While the analysis that follows differs in many respects from that of Kafoglis, it is essentially a variation of his net demand curve model.

## Partial Individual Net Demand Curves

Let Figure 1 illustrate individual A's preference field for good X, a public good, on the horizontal axis and private goods on the vertical axis. A's original income or budget line is $B_1^1$, which corresponds to price $P_1$ for good X. Superscripts indicate the level of provision by individual B. Subscripts indicate price. This budget line indicates the opportunity locus of all bundles available to A. Individual A will choose the bundle indicated by $E_1^1$ where his budget line is tangent to his highest indifference curve, $I_1^1$. He will purchase $Q_1^1$ of good X and $Z_1^1$ of private goods at $P_1$. Similarly, if the price changes to $P_2$, A will choose $E_2^1$ consisting of $Q_2^1$ of X and $Z_2^1$ of all other goods. At this point his new budget line, $B_2^1$, is tangent to his highest indifference curve, $I_2^1$. Again, at price $P_3$ his budget line will be indicated by $B_3^1$. He will choose $E_3^1$ consisting of $Q_3^1$ of X and $Z_3^1$ of all other goods.

The points $E_1^1$, $E_2^1$, and $E_3^1$ indicate a price quantity relationship for individual A for good X. As the price of X changes from $P_1$ to $P_2$ to $P_3$, he chooses $Q_1^1$, $Q_2^1$, and $Q_3^1$ of the public good. This relationship is shown in Figure 2 as $D_1$. $D_1$ is A's independent demand curve for the public

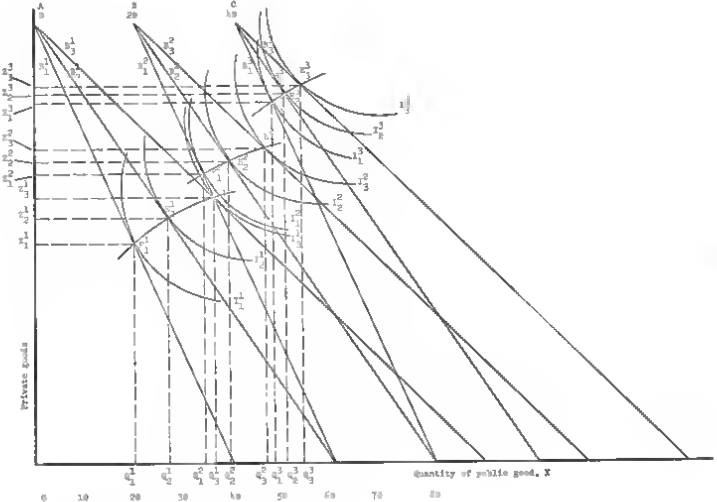


Figure 1 --Demand For a Public Good With Income Effects

good. In the terminology of this chapter, $D_1$ is also his partial individual net demand curve with zero provision by individual B.

Look again at Figure 1. Notice three more budget lines that are parallel to our original 3 lines. However, instead of originating on the vertical axis they originate 20 units to the right at point B on a line perpendicular to the vertical axis. What does this indicate? It indicates that A has somehow been provided with 20 units of X through no effort of his own. The units have been provided to him at no cost because B has purchased them and they are equally available to A. The three new budget lines, parallel to our original lines, indicate that A is free to use his income just as he did before, except that he will now make his decision based on the availability of 20 units of X provided to him by B.

What amount will he choose at $P_1$? He will now choose $E_1^2$ consisting of $Q_1^2$ of X and $Z_1^2$ of all other goods. His preference field is still the same. B's provision of X has not changed A's taste for the good. He will choose the amount that corresponds with the point where his budget line is tangent to his highest indifference curve. The difference is that his budget line is now twenty units to the right at every point reflecting the 20 units provided by B. Although he chooses $Q_1^2$ of good $X_1$, he only pays for $Q_1^2 - 20$ units.[1]

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[1] At this point the analysis differs from that of both Olson and Sharp-Samarras. Olson would say that if B has purchased 20 units of X at, say, $P_1$ and if 20 units happened to be more than A would purchase acting independently, then A would definitely not purchase any amount of X. This analysis shows that the amount A will purchase after receiving some quantity of X from B at no cost will depend on his new position in his preference field. Olson ignores the income effect of B's purchase. B's purchase has effectively moved A to the right in his preference field. His purchases depend on the shape of his indifference curves in the new region of his indifference map. If he were in an area where the

A's purchase, $Q_1^2$ - 20 units, is less than $Q_1^1$. This is because A has been provided with 20 units of good X by B. The amount of X at his disposal relative to all other goods has increased. With the same income at his disposal, A should be expected to decrease his purchases after he begins to enjoy B's purchase.[2]

At $P_2$, A will now choose $E_2^2$ which includes $Q_2^2$ of X. If the price is changed to $P_3$, he will choose $E_3^2$ including $Q_3^2$ units of X. As with $P_1$, the amounts actually purchased will be $Q_2^2$ - 20 and $Q_3^2$ - 20. Again, this relationship can be shown in Figure 2 as $D_2$. At $P_1$, $P_2$, and $P_3$, A chooses $Q_1^2$, $Q_2^2$, and $Q_3^2$ of X, respectively, resulting in purchases of $Q_1^2$ - 20, $Q_2^2$ - 20, and $Q_3^2$ - 20 units of X. $D_2$ is A's partial individual net demand curve for X when B is providing 20 units at no cost to A.

Looking to the right in Figure 1, notice another set of budget lines parallel to the first and second sets. This set begins at point C and proceeds to the horizontal axis. Point C is 20 units from point B and 40 units from point A, indicating that A is being provided with 40 units at no charge. Again it is B who provides the units of X. We could work

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slope of his new budget line at the current price is steeper than the relevant indifference curves, it would be true that he would not purchase any amount of the good. This is not the case with the indifference map as shown in Figure 1. A will purchase $Q_1^2$ - 20 units of good X

On the other hand, Sharp and Escarraz would say that A faces a zero price after B has provided some X at no cost to A. This also is not true. A faces the same price after B's purchase as he did before. While Sharp and Escarraz correctly indicate that A is in disequilibrium, they incorrectly analyze its nature. Depending on the shape of his indifference curves in the relevant region, A may or may not purchase more of good X. See Chapter 3 for a more detailed analysis.

[2] If a child has an allowance of 30¢ a day and normally buys two ice cream cones at 10¢ each and one candy bar at 10¢, it is safe to assume that if he is given 3 ice cream cones free each day he will decrease his expenditures on ice cream if their relative prices remain the same.

through the process of deriving A's demand curve for X is the presence of a 40 unit "gift" from B, but this would add redundancy with no gain in clarity. At $P_1$, $P_2$, and $P_3$, A will choose $Q_1^3$, $Q_2^3$, and $Q_3^3$ of X. He will purchase only $Q_1^3 - 40$, $Q_2^3 - 40$, and $Q_3^3 - 40$ units, respectively, however. This relationship is shown in Figure 2 as $D_3$, A's partial individual net demand curve when B provides 40 units at no cost to A.

Figure 2 shows that $D_3$ lies to the left of $D_2$ and that $D_2$ lies to the left of $D_1$. This is to be expected. The greater the amount of X that B provides for A the less he is likely to purchase at each possible price. It would be possible to redraw A's preference map so that different demand curves would result. Indeed, we could drew his map in such a way that he would not purchase any X after some small purchases by B. Such a map would result in the Olsen conclusions. The point is that the shape of his preference field will determine A's behavior after some purchase by B. Contrary to both the Sharp-Encarnac and Olsen analyses, it is not apparent what A's actions will be from an examination of his independent demand curve.

## Individual Net Demand Curves

For simplicity assume that B has exactly the same preference field as A. This will eliminate the necessity of deriving his net demand curves since they will be exactly the same as A's. That is, at each level of provision -- zero, twenty, or forty units -- he will choose exactly the amounts of X at various prices as did A.

Partial individual net demand curves are interesting, but they do not show what quantities of good X individuals A and B will actually purchase. Individual A's partial individual net demand curves show the

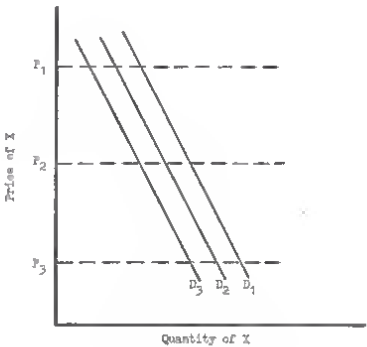


Figure 2.--Partial Individual Net Demand Curves

quantities of X that A will purchase at various prices, given that B has already provided some quantity. Individual B's curves yield the same information, given some quantity purchased by A. Both sets of curves are conditional. It is still not clear what the total quantity purchased will be. We have A's demand curves, given B. We have B's demand curves, given A. The output resulting when the purchases of both A and B are allowed to vary has not been established.

Figure 3 requires some explanation. It is essentially a rearrangement of the information shown in Figure 1. The horizontal axis measures the quantities of X that A will purchase, given some level of provision by B measured on the vertical axis. The vertical axis measures the quantities of X that B will purchase, given some level of provision by A measured on the horizontal axis. When discussing A's behavior, the horizontal axis measures the dependent variable -- A's purchases -- and the vertical axis measures the independent variable -- B's purchase. When discussing B's behavior, the vertical axis measures the dependent variable -- B's purchases -- and the horizontal axis measures the independent variable -- A's purchases.

The various lines on the graph show either A's behavior at certain prices, given various purchases by B, or B's behavior at certain prices, given various purchases by A. $P_2^A$ indicates the varying amounts of X that A would purchase at $P_2$ if B's purchases were to vary. $P_2^B$ indicates the varying amounts of X that B would purchase at $P_2$ if A's purchases were to vary. The subscript indicates the price with which we are concerned. The superscript indicates which individual's behavior is dependent.

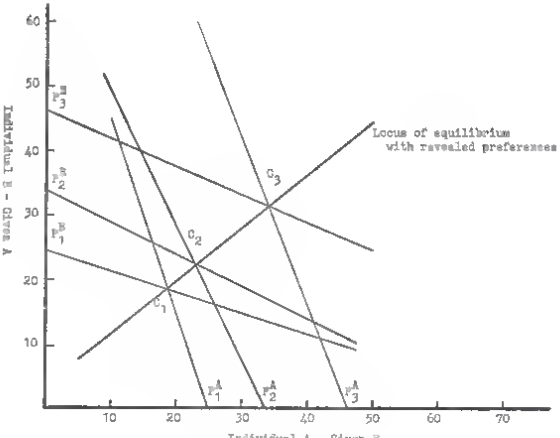


Figure 3.--Equilibrium Quantities

What quantities will A and B actually purchase at $P_2$? It will be those quantities indicated by the intersection of $P_2^A$ and $P_2^B$ -- point $C_2$ in Figure 3. Only at this point are both A and B in equilibrium. There will be no incentive for either individual to alter his purchases. A will purchase 23 units, and B will purchase 23 units. A is in equilibrium because at $P_2$, 23 units is just the quantity of X that he desires to purchase, given that B had already purchased 23 units. B is in equilibrium because at $P_2$, 23 units is just the quantity that he wishes to purchase, given that A had already purchased 23 units. At any other position, either A or B would be out of equilibrium and the situation would be unstable. There is no reason for either A or B to purchase more or less than 23 units of X if price is $P_2$. The reason the respective amounts purchased by A and B conveniently turn out to be equal is because we assumed they had equal preferences. Similarly, at $P_1$ and $P_3$, A and B will be in equilibrium at points $C_1$ and $C_3$. As at $P_2$, both will purchase equal amounts of X at $P_1$ and $P_3$.

What does the locus of points $P_1$, $P_2$, and $P_3$ indicate? It indicates the various amounts of X that A and B will purchase at various prices in a situation where the amount purchased by A will be available to X and vice versa. Both individuals reveal their true preferences. The locus of points is A's demand curve, not of B's purchases. It is also B's demand curve, not of A's purchases.

The final relationships are shown in Figure 4. An individual set demand curve is shown which could reflect the actions of either A or B since they have similar preferences. The horizontal sum of their set demand curves is shown as set total demand. In addition, the individual independent demand curve of each is shown. The vertical sum of their

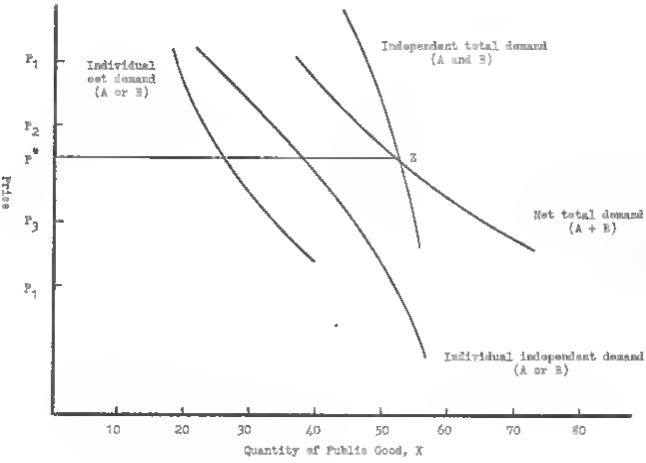


Figure 4.--Net Total Demand with Revealed Preferences

independent demand curves is shown as independent total demand. Individual net demand curves lie to the left of individual independent demand curves.

Net total demand lies above independent total demand to the right of Z. At Z the quantity provided by individuals acting independently will be optimal -- the intersection of marginal cost and the vertical sum of independent demands. $P^*$ is the price that will cause A and B to provide this quantity acting independently. At this price, Sharp and Escarraz would be correct. At prices above $P^*$, provision of the public good would be less than optimal. For these prices, Mancur Olson's results would be correct. At prices less than $P^*$, supply of the public good would be greater than the optimal quantity.

Net Demand Curves with Concealed Preferences

Up to this point the analysis has not confronted the problem of concealed preference. What if A or B or both decide to act strategically and conceal their preferences? What effect will this have on net demand? Figure 5 is the same as Figure 3 except that parallel to and below $P_1^B$ is another line, $P_{11}^B$. This line indicates that individual B has decided to conceal part of his preferences. For each level of purchase by A, B will now purchase less than his preference map in Figure 1 would indicate at $P_1$. There are similar lines parallel to $P_2^B$ and $P_3^B$ labeled $P_{22}^B$ and $P_{33}^B$, respectively. These lines indicate that for each level of purchase by A, B will now purchase less than his preference map would indicate at prices $P_2$ and $P_3$. Individual B is concealing his preferences by refraining from purchasing the public good.

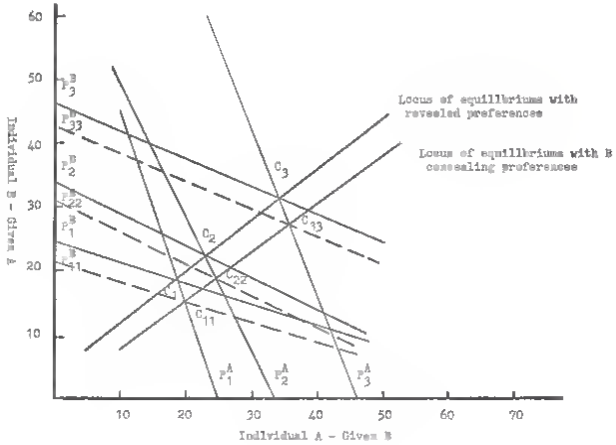


Figure 5.—Equilibrium Quantities - Concealed Preferences

$P_{11}^B$, $P_{22}^B$, and $P_{33}^B$ now intersect $P_1^A$, $P_2^A$, and $P_3^A$ at $C_{11}$, $C_{22}$, and $C_{33}$, respectively. These are the new equilibrium points for individuals A and B with B concealing part of his true preferences. B still has the same preferences as A, but now he is concealing them, hoping that A will purchase more of the public good. It is clear that at $C_{11}$, B is purchasing less of the public good than he was at $C_1$, while individual A is purchasing more. Individual A is not concealing preferences, but individual B is. Individual A ends up purchasing more because B's new behavior line, reflecting his concealed preferences, intersects A's behavior line at a different point. A will purchase more because B is purchasing less (because of his concealed preferences).

At each of the new equilibrium points -- $C_{11}$, $C_{22}$, and $C_{33}$ -- A will purchase more and B will purchase less. B's smaller purchases, because he is concealing preferences, induce A to purchase more at a given price. The final relationships are shown in Figure 6. Figure 6 has all of the information contained in Figure 4. In addition, it shows A's net demand curve, with B concealing preferences, and B's net demand curve reflecting his concealed preferences. A's net demand curve lies to the right of his previous net demand curve reflecting greater purchases at each price. B's net demand curve lies to the left of his previous one reflecting smaller purchases at each price. A's net demand curve should shift less to the right than B's net demand curve shifts to the left. This is because when B cuts back his purchases, concealing his preferences, A's income line will be shifted to the left by the amount of the decrease. It is unlikely that he would respond to this by purchasing enough additional X to make up for B's reduction.

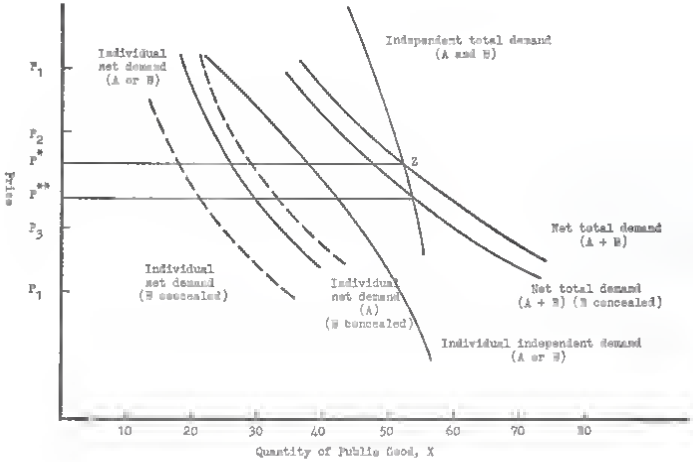


Figure 6.--Net Total Demand with Concealed Preferences

Because A's net demand curve shifts to the right less than B's net demand curve shifts to the left, net total demand, the horizontal sum of individual net demands, will shift to the left as shown in Figure 6. Net total demand now intersects independent total demand below and to the right of the old intersection. $P^*$ will no longer result in the optimum supply of good X with A and B acting independently and with B concealing part of his preferences. $P^{**}$ will now result in the optimum provision of good X.

If preferences are concealed, it will take a lower price to result in the optimum provision of a public good when individuals act independently. If preferences are concealed, the public good may be underprovided, overprovided, or optimally provided. There is no a priori reason to expect any one of these possibilities. If preferences are concealed, underprovision is more likely to result than if they are not concealed. This is because net total demand will be less at each price when at least one individual is concealing preferences. Interestingly, it is possible that concealed preferences may result in an optimum quantity when revealed preferences will not.

## Summary of Results

Private provision may result in quantities of public goods which are less than optimal, greater than optimal, or optimal.[3] It is impossible to tell without first examining the preference maps of the relevant individuals and then deriving net demand curves. There is only one price which will result in optimal provision when individuals act independently.

[3] Buchanan and Kafoglis reach similar conclusions using a game theory approach to private markets (10).

It is likely that most public goods will be underprovided but it is not certain. Olson would say that it is certain. The price of many public goods may be so high that no individual will purchase any quantity acting independently. If prices are relatively high, public goods will be underprovided as shown in Figure 4. It is certain that public goods will not always be provided optimally as indicated by Sharp and Escarraz. Chapter 3 will examine the Sharp-Escarraz and Olson models more closely.

The introduction of concealed preferences does not alter these results. It is more likely that public goods will be provided suboptimally with concealed preferences because a lower price will be required in order for the optimal amount to be purchased by individuals acting independently. If public goods may not be provided optimally in the market place, then alternative institutional arrangements should be examined. Chapter 4 will examine the supply of public goods, as well as other goods, in a democracy.

## CHAPTER 3

## OTHER APPROACHES TO THE PRIVATE SUPPLY OF PUBLIC G[illegible]

Chapter 2 presented a model that demonstrated the characteristics of the private supply of public goods. In the course of that presentation, mention was made of the competing models of Mancur Olson (31) and Sharp-Escarraz (42). Mancur Olson concludes that the private supply of public goods will always be less than optimal. Sharp and Escarraz argue that supply will be optimal. Both rely on independent demand curves to arrive at their conclusions.

The conclusion reached in Chapter 2 was that, relying exclusively on independent demand curves, it is impossible to tell whether the private supply of public goods will be optimal. It is necessary to derive the net demand curves of the relevant individuals and also to know the market price of the good before the level of provision can be determined. This chapter will analyze in some detail both the Olson and Sharp-Escarraz models. Olson's reliance on independent demand curves leads him to ignore the income effect of one individual's purchases on the demand of another for a public good. Sharp and Escarraz are misled into assuming that an individual faces a zero price for a public good once another individual has provided him with some of the good at no cost.

## The Olson Model

Olson addresses two questions concerning the provision of public goods by groups. First, he asks whether such goods will be provided at all. He finds that they will be provided when at least one individual values the good sufficiently to undertake its provision independently. Then he asks whether that provision will be optimal. He finds that even if public goods are provided, their provision will always be less than optimal.

Figure 7 shows total demand for a collective good, good X. Total demand, DD, is the vertical sum of individual demands for the good in this case, two individuals given by aa and bb. For simplicity, the marginal cost, MC, is constant, and price, P, is equal to MC. The assumption of constant marginal cost is not necessary to his argument. The same results would follow with increasing marginal cost. With the given demand and marginal cost curves, the optimal level of provision is $q_1$, that quantity where marginal cost equals the vertical sum of individual demands (40, pp. 28-29). Olson finds that under the conditions shown in Figure 7 none of the public good will be provided. An individual will purchase units of a public good only when his gains from the purchase of that good will at least cover the costs. Since the individual demand curves in Figure 7 lie everywhere beneath marginal cost, no individual will find it in his interest to undertake provision of the good.

Figure 8 shows a situation similar in most respects to that in Figure 7. In this case, however, individual A's demand curve, aa, lies in part above marginal cost. It intersects marginal cost above $q_1$. Under these conditions, individual A will undertake the provision of X. It will

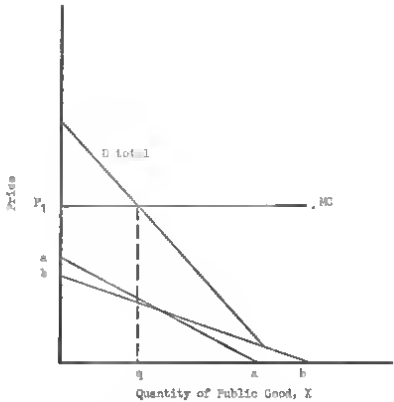


Figure 7.—Ineffective Demand for Public Good

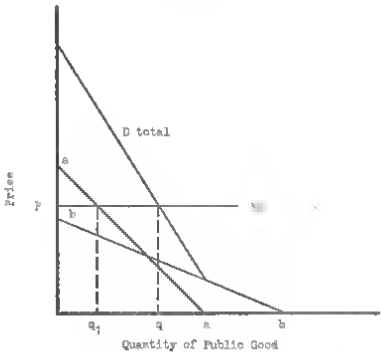


Figure 8.—One Individual with Effective Demand

be in his interest to purchase $q_1$ units of the collective good. Individual A will realize net benefits by purchasing units of X up to the point where marginal costs equal marginal gains from the purchase of X, point $q_1$. Individual B, however, will not find it in his interest to purchase any amount of X. His demand curve, $D_B$, lies everywhere below the marginal cost or price of X.[1] He would experience a net loss from any independent purchase of X (31, pp. 24-25).

Olson concludes that a public good will be provided as long as one individual, acting independently, experiences net benefits from some level of provision. If there is no level of provision where an individual experiences net benefits, the public good will not be provided by consumers acting independently. Even if the good is provided, it may not be provided at the optimal level. In Figure 8 the optimal level of provision is q. Yet, individual A will provide only $q_1$ and individual B will provide none. In this case the public good will be underprovided.

Even if some portion of the demand curves of all individuals lie above marginal cost, the public good will not be provided optimally. This is the situation shown in Figure 9. As soon as individual A, the consumer with the largest effective demand (that is, an intersection of his demand curve and marginal cost at the highest quantity of X), has purchased what he views as the optimal quantity for himself, $q_1$, other members will find that they are being provided with more of the collective good than they want at the current price. For example, B desires only $q_2$ at the existing price. There would be no incentive for him to purchase additional units of X since marginal costs would be greater than marginal

[1] The ability to exclude individual B would not affect the outcome in this situation. If A could exclude B from the benefits of the public good, B would still not find it in his interest to purchase any amount of X.

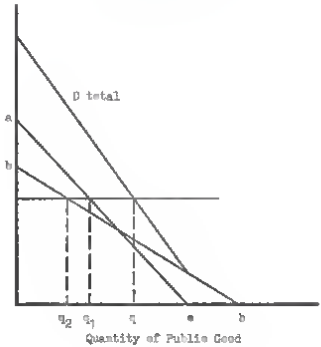


Figure 9.--Two Individuals with Effective Demand

benefits (31, p. 28). Even if collective goods are provided individually, they will be provided at a suboptimal level.

Olson argues that, once the individual with the greatest demand for the good had independently purchased the amount he desires, "no one in the group will have an incentive independently to provide any of the collective good" (31, p. 28). This conflicts with the findings in Chapter 2. If individual A provides B with some quantity of the public good, it will alter B's demand for the good. As demonstrated in Chapter 2, A's provision of the good will have an income effect on B. His budget line will be shifted to the right and he will be operating in a new area of his preference map. It is impossible to tell what his actions will be without an examination of his new position in his preference field. Net demand curves must be derived before the outcome of the interaction between A and B can be determined.

Olson goes on to say that not only will collective goods be provided suboptimally in the market, but also "other things being equal, . . . the more individuals in the group, the more serious the suboptimality will be" (31, p. 28). This is because in bigger groups the proportion of total demand attributable to the individual with the largest demand will likely be smaller. Olson concludes that "where small groups with common interests are concerned, there is a systematic tendency for 'exploitation' of the great by the small" (31, p. 29). This means that the individual with the largest demand will be exploited by other members in the sense that they will enjoy the collective good which he provides, but contribute nothing to its provision.

In summary, Olson considers that collective goods will be provided independently only if the demand of at least one individual exceeds

marginal cost, or price, at some level. This result is correct and would follow from an analysis of net demand curves. Further, Olson argues that, even if the public good is provided, the level of provision will be suboptimal and those with the largest interest in the provision of the good will be "exploited" by those with a lesser interest. This is not necessarily true. An examination of net demand curves is required to determine the level of public-goods supply.

The Sharp-Escarraz Model

The thrust of the Sharp-Escarraz analysis is that private markets will provide an optimal allocation of public goods.[2] The conventional criticism that an optimum will not be reached because of the problem of concealed preferences must be rejected because: (1) it is based upon conclusions deduced from an unsatisfactory definition of a public good, (2) even if this unsatisfactory definition is accepted, those who conceal their preferences will be in a state of disequilibrium and will have an incentive to reveal them; (3) even if preferences are not revealed, it does not follow that an optimum will not be reached (42, p. 130).[3]

This section will be concerned with a refutation of the Sharp-Escarraz analysis. In particular, their point that individuals who conceal their preferences will face a zero price will be disputed. The

[2]This is not the same as the Coase argument (13) that, when discrepancies exist between social cost and private cost, the determination of liability will not affect allocation. Coase argues that, if liability is fixed as the barring party or if bargaining between the parties takes place, the allocation of resources will be the same. The question of liability is a question of equity, not efficiency. Sharp and Escarraz say there is an problem of efficiency. See Ralph Turvey's 1963 article for a summary of this literature (44).

[3]See also The Price Theory of Value in Public Finance (17) in which Escarraz devotes a chapter to this subject.

contention that such individuals face a zero price is based upon their reliance on independent demand curves. In fairness, it should be pointed out that the Sharp-Escarraz analysis was written a decade ago.

Paul A. Samuelson, in his 1954 and 1955 papers (34, p. 387; 35, p. 350), described a public good as one for which each man's consumption, but not necessarily enjoyment, is equal to the consumption of all others and to the total consumption. Although he used the term social good, Musgrave's presentation is essentially a direct adaptation of Samuelson's model (29, pp. 80-84). It is this Samuelson public good which bears the brunt of the Sharp-Escarraz attack although Musgrave's adaptation is singled out. It is Samuelson's pure public good that is classified as unsatisfactory by Sharp-Escarraz. Samuelson has since modified his famous definition. He now defines a public good as "one that enters two or more persons' utility." His new definition leaves us "with a knife edge pole of the private good case, and with all the rest of the world in the public good domain" (36, p. 108). This last definition was published after the Sharp-Escarraz piece.

Citing a work by Milton Z. Kafoglis on collective demand (22, pp. 33-38), they conclude that the problem of revealed preferences rests on a definition of collective demand which is not widely applicable (42, p. 133). But Kafoglis does not deal exclusively with a public good in the original Samuelson-Musgrave sense; "joint (collective) demand is defined as the price-quantity relationship for goods and services which yield joint (collective) satisfactions" (22, p. 22). He deals with any good that enters more than one preference function. In addition to public goods, Kafoglis deals with the phenomenon which Bator calls Technical Externality (1, pp. 365-369). "Kafoglis's analysis then, is not

rigorously tied to the indivisibility of supply" (42, p. 133). While the later "knife-edge," Samuelson definition may include most of the goods that Kafoglis discusses, it is clear that Musgrave and Kafoglis are discussing different things. The Musgrave good is a special case of the Kafoglis good.

Neither Samuelson nor Musgrave intended that their analyses apply to the range of goods discussed by Kafoglis. The problem of revealed preferences arises from the public-goods phenomenon. To criticize a definition of a public good because it does not "apply to a wide range of collective activity" is analogous to criticizing a definition of cancer because it does not apply to a wide range of diseases.

The fact is, however, that the public-good phenomenon does apply to a wide range of collective activity. The early Samuelson definition requiring equal consumption implies only that the relevant populaties have equal consumption available to them. The relevant population need not be the entire population of the United States nor even the entire population of Florida. The police force in Gainesville provides a public good for that town's citizenry. A television station in Jacksonville provides a public good for those in the range of its signal.[4] It is jointness of consumption that creates the problem of revealed preference.

The criticism that Musgrave uses an unsatisfactory definition of collective good because it does not apply to a wide range of collective activity is unsound for two reasons. It is unsound because Musgrave-Samuelson have no intention of defining a collective good of the type

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[4]For an interesting exchange on the merits of subscription vs. free television, see the extended Minasian--Buchanan-Samuelson debate in The Journal of Law and Economics (27, 28; 37, 38; 9).

desired by Sharp-Escarraz. They wish to define a public good. The criticism is unsound also because the definition, in fact, does apply to a wide range of collective activity.

"Accepting the equal consumption definitions of a public good" (42, p. 134), Sharp and Escarraz proceed to demonstrate that true preferences will be revealed anyway. This will occur because the individual who does not reveal his true preferences will find himself in disequilibrium. That is, his marginal rate of substitution will be greater than the zero price he faces and he will have an incentive to buy more of the good. In contrast to the Samuelson general equilibrium approach, Sharp and Escarraz utilize a partial equilibrium analysis. In Figure 10 the optimum level of provision is $oq$ where collective demand, DD, equals marginal cost, MC. If B conceals his preferences, collective demand will be only $ee_1$, A's demand. He will provide only $oq_1$.

> Taxpayer A is in equilibrium but taxpayer B is not; for, if B's tax share is zero as it would be if B does not reveal any preferences for X, B really desires $oq_2$ of X at the existing zero price (my emphasis) and instead is getting $oq$ of X. Taxpayer B may have a strong inclination to reveal at least some of his preference. If B reveals part of his preference, his tax share of the $oq$ of X rises and A's share declines. Now, at a lower price to A (DP-B's Price), A demands a greater quantity of X . . . . Finally taxpayer B reveals his true preference and $oq$ of X is supplied, and costs are distributed in accordance with the individual marginal preferences of taxpayers A and B. (42, p. 134)

It does not seem clear at all why taxpayer B, who for some reason has chosen to conceal his preferences, "may have a strong inclination to reveal at least some of his preference" just because A has purchased some of the good.[5] If B's demand was not great enough to purchase a unit of

[5] Buchanan and Stubblebine discuss Pareto-relevant and Pareto-irrelevant externalities (11, pp. 371-377). The gist of the argument is that disequilibriums are irrelevant to Pareto efficiency unless there are

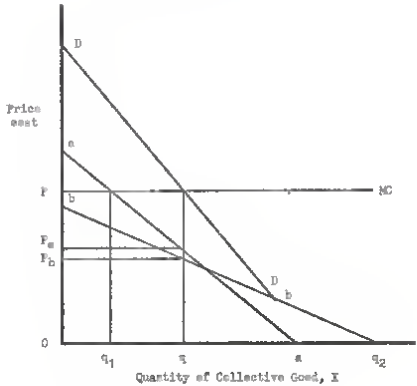


Figure 10.--The Sharp-Escarras Model

X, as indicated in Figure 10, when he had none of the good, it is not evident that he would purchase one after A has already provided him with one free. The fallacy in the Sharp-Escarras reasoning is that they deduce that, since A is providing B with one unit for which he contributes nothing, there is an "existing zero price" facing B. Since B wants $oq_2$ of X at a zero price, he is out of equilibrium and will have a "strong inclination to reveal at least part of his preferences."

But B does not face a zero price! Assuming Sharp and Escarras intend that the horizontal MC curve implies a constant price of good X, it is clear that B faces the same price that A paid for the first unit. Further, that price lies above B's demand curve at every point. It seems he would have a "strong inclination" to refrain from revealing his preferences if the way to reveal them is to purchase X.

Figure 11 provides a more illustrative picture of B's situation after A's purchase of $oq_1$ of X. $I_1 - I_4$ are B's indifference curves for X on the horizontal axis and private goods on the vertical axis. The marginal cost of X is shown by the slope of CF, B's budget line in Figure 11. CF is steeper than all of B's indifference curves in the relevant area so he will purchase zero units of X at the given price (MC). If A purchases $oq_1$ units of X at zero cost to B and if the price for more units remains the same to B, his new effective budget line is CDG. CD is equal to $oq_1$ units of X. The effect of A's purchase has been to move B's budget or income line to the right. He now can have more private goods, more X, or both. However, the slope of DG, the MC or price of X, is the same as the slope of CF. DG does not affect a

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gains from trade to be achieved. A mere desire on the part of an individual to improve his position is not sufficient. The assumption here is that there are gains to be achieved by taxpayer B.

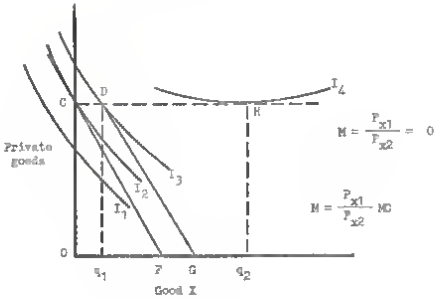


Figure 11.—The Income Effect

tangency with any of B's indifference curves in the relevant area. B will not reveal his preferences by purchasing some amount of X.

If there were indeed an "existing zero price" facing B as indicated by Sharp and Escarraz, it would be reflected by a price or budget line with zero slope as shown by CDH. Taxpayer B would purchase $oq_2$ of X at zero price where the budget line is tangent to indifference curve $i_4$. The point is that in the situation described by Sharp and Escarraz, there is no existing zero price facing B. Price is constant and line shows B's demand curve at all levels. B has no incentive to reveal his preferences.

It should be pointed out that Sharp and Escarraz correctly realize that B might be in disequilibrium. However, B's actions cannot be accurately determined without reference to his preference map. There will be an income effect on B resulting from A's purchase. This effect will shift B's budget line to the right in his preference field. If the new budget line affects a tangency with one of B's indifference curves, he will purchase more of the good. This will in turn have an income effect on A. This process could lead to an optimal quantity of the public good.

Finally, Sharp and Escarraz argue that "if preferences for collective goods are not revealed that it does not necessarily follow that an optimum quantity is not supplied" (42, p. 135). Unrevealed preferences may only mean that some collective wants are unsatisfied. Unsatisfied wants, be they collective or private, are not unique. They must be "effectively" expressed.

> This means, in the market, that wants have to be combined with ability, this means, in the public exchange economy, that wants have to be combined with a vote. The optimum quantity of collective goods is that quantity corresponding to where marginal cost equals as effectively expressed demand. (42, p. 135)

The logic of the Sharp-Escarraz argument is: (1) the optimum quantity is that quantity where effectively expressed demand equals marginal cost; (2) effectively expressed demand consists of wants combined with a vote; (3) it follows that the optimum quantity of a public good is that quantity where wants combined with a vote equal marginal cost. There are two points to be made about this argument. First, their definition of the optimal quantity is quite different from the usual one. Second, it is not clear what is meant by the idea that wants have to be combined with a vote.

The Sharp-Escarraz treatment of optimality seems confused. When presenting their preference-revealing, optimum-seeking mechanism, they seem satisfied with a conventional definition of optimality. In Figure 10, $o_1$ is the optimum output where the sum of individual demand curves for the public good equals marginal cost. Later they redefine the optimal quantity as that quantity where effectively expressed demand equals marginal cost. The whole problem with public-goods supply is that demand is ineffectively expressed. Consumers conceal their preferences resulting in a less than optimal (in a conventional sense) provision.

Pareto optimality requires that no one can be made better off without at least one person being made worse off. This is a characteristic of the conventional optimal solution, the one first used by Sharp-Escarraz. The effectively expressed demand definition is not compatible with the conventional definition unless all demand is effectively expressed. Sharp and Escarraz dispute the conventional wisdom that optimality might not be reached by redefining optimality as that which is reached — effectively expressed. This borders on tautology.

They define effectively expressed demand for a public good as wants combined with a vote. It is not clear what this means. It could mean that each individual who wants some quantity of a public good and who also has a vote should get the quantity that he votes for. It is more likely that it means that the quantity that emerges from the voting process is the optimal quantity. This, of course, implies single-peaked preferences if the voting process is a democratic one. This would mean that the quantity that is optimal would be the one desired by the median individual as shown by Duncan Black (2).[6]

The Sharp-Escarraz argument that concealed preferences do not imply that an optimum will not be reached is unconvincing. It is meaningless in terms of conventional analysis since they redefine the optimal quantity. It is also unclear what they mean by their new definition of optimality.

Sharp and Escarraz correctly point out that an individual who is being provided with some quantity of a public good may be in disequilibrium. This is because one individual's purchase of a public good will have an income effect on other individuals. Their contention that the Samuelson-Musgrave definition of a public good is unsatisfactory seems unconvincing. Their conclusion that an optimum will be reached by individuals acting independently may not always be appropriate because individuals will not face a zero price after some quantity has been provided at no cost. Their support of the proposition that "it does not necessarily follow that an optimum quantity of collective goods is not supplied even if there are unrevealed preferences" is confusing. It

[6] Chapter 4 will show that, if bribery is allowed, the quantity of a public good provided in a democracy will be that quantity where the sum of marginal benefits equals marginal costs.

makes use of a [illegible]ion of optimality that is unclear and unsupported.

## Summary

Mancur Olson argues that public goods will always be provided at a suboptimal level. Sharp and Escarraz argue that they will be optimally provided. Olson's result will not always follow because it ignores the income effects demonstrated in Chapter 2. Sharp and Escarraz are incorrect mainly because they deduce that an individual who is provided with some amount of a public good at no cost faces a zero price. Public goods may be underprovided, overprovided, or optimally provided depending on the preference fields of the relevant individuals and on the marginal cost of the good.

## CHAPTER 4

## THE PUBLIC SUPPLY OF PUBLIC GOODS

It is not enough to examine the supply of public goods in the private sector. The growing budgets of state, local, and federal governments lend increasing urgency to the problems of public-goods supply in the public sector. The growing interdependencies of modern societies indicate increasing interdependencies of consumption. In the last few decades economists have begun to turn their attention to consideration of the allocation of resources that might emerge from the workings of democracy (2; 3; 6; 12, 15, 16; 18; 21; 31; 41). A few of these have dealt with a comparison of the budget size that emerges from the democratic process and the proper or "correct" budget size judged by various criteria of "correctness." No consensus has emerged from this work.

Anthony Downs argues that the budget will be too small because of rational ignorance on the part of the electorate (16, pp. 93-95).[1] Buchanan and Tullock show that, if there are either differential benefits or differential taxes associated with government programs, the budget will be too large (12, pp. 147-169). Side payments or logrolling tend to reduce the imbalance. Tullock (43, p. 578) argues that projects with differential benefits will be overextended. Further, if a given sum is

[1] Citizens will be more aware of costs than benefits. Accommodating politicians try to give voters what they want, not what is best for them. Since costs are more obvious than benefits, some programs whose benefits exceed costs will not be enacted.

allocated between a project of differential and one of general benefit, the general project will suffer. Conversely, Johnson (21, p. 12) concludes that projects of general benefit will be overprovided while those of special benefit will be underprovided because of differences in citizens' perceptions of the benefits. Davis and Meyer (14, p. 13) argue that the budget will be too large because games which are negative-sum for society, but positive-sum for some majority, will be played.

While certain of these works distinguish between projects in terms of the generality of benefits, projects are not differentiated in terms of the type of goods being provided. A program may provide private goods to all citizens resulting in general benefits in the sense that all citizens benefit. However, there may be no inherent generality of benefits to some technically fixed group, such as those associated with public goods. A program may provide a public good to a few citizens, resulting in differential benefits in the sense that only a portion of the citizens benefit. However, there is generality of benefits in the sense that the good inherently provides general benefits to the relevant citizens.

An analysis of the "correct" budget size requires some notion of what is "correct." A definition of this concept will be provided in the next section. A more elaborate discussion appears in Chapter 5. The size of the total budget -- as well as that for specific goods -- that emerges from a democracy will be compared with the "correct" size. It will be found that the budget in a democracy is too large.

It would be an ambitious undertaking to compare the output of real-world democracy with this study's notion of correctness. The more modest objective of the present effort is the discussion of the size of

the budget in a pure democracy. There are no parties. There are no legislatures. Citizens vote directly on the various projects that are presented. There is a limit to neither the number nor the size of various projects that can be on the ballot. There is no limit to the number of votes that can be taken on a given issue.[2] In addition, there are no restrictions on side payments between citizens. They can sell their votes if they wish. The limits of the conclusions that can be drawn from this analysis are indicated by these restrictions.

## The Model

Davis and Meyer make a strong argument that the budget is too large in a democracy (14, pp. 10-13). However, they deal only with whether a game should be played.[3] This is a significant contribution, but it stops short of dealing with the size of individual programs. A more complete investigation into the efficacy of democracy in providing a correct budget size should deal with the size of individual programs as well as whether a program is a good one. A democracy is underbudgeted when a program is not sufficiently extensive just as it is when a "correct" program is excluded. It is overbudgeted if a program is over-extended just as it is when an "incorrect" program is included.

The size of the budget for a particular program will vary with the type of good or service being provided. Three types of goods will be considered here — private goods, public goods and semi-public goods.

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[2] See Duncan Black's The Theory of Committees and Elections (2) for an excellent analysis of the process.

[3] In the Davis and Meyer terminology, a game is any potential government program that the citizens of a democracy might consider.

Private goods are goods whose benefits accrue entirely to the individual who consumes them. There are no external benefits conferred on other individuals by the production or consumption of private goods. Goods like food and clothing are private goods.

Public goods and semi-public goods require some elaboration. Paul A. Samuelson has been the major contributor to public-goods theory. As pointed out in Chapter 1, in 1954 he defined public goods as the type of good characterized by equal consumption -- not equal enjoyment -- by all members (34, p. 387, 35, p. 350). In 1966 Samuelson modified his definition to include all goods that enter at least two persons' utility (36, p. 108). There is a "knife edge" that separates the rather limited domain of purely private goods and all other goods. These other goods should be known as public goods.

The effect of this redefinition was to include almost all goods in the realm of public goods. If the production or consumption of a good affects the utility of at least two persons, it is a public good. For purposes of this analysis, public goods will be the type of good originally designated by Samuelson as a public good. That is, public goods are characterized by equal consumption by all members of society. Semi-public goods are all goods included in Samuelson's latest definition except public goods. Semi-public goods include all goods that enter into at least two persons' utility functions except the limiting case of a public good which enters all utility functions.

This distinction between Samuelson's old definition and his more recent one is not required logically nor is it an attempt to further modify Samuelson. It is made for purposes of exposition that will become clear below. The distinction will illustrate certain characteristics of

government provision that depend on the generality of benefits from a good. More precisely, the more general the benefits of a public good, the closer a democracy will come to provision at the "correct" level.

The costs of government provision of goods will be considered in two dimensions in this model. If government provides a private good to its citizenry, there are costs involved in extending some fixed amount of the private good to more and more citizens. For example, if a decision is made to provide two loaves of bread per week to certain members of society, there are positive marginal costs associated with the inclusion of additional members in the program. That is, program cost or program size can vary in the sense that the number of persons included in the program increases or decreases. If more persons are included in a program to provide a fixed amount of private goods per person, then program size and program costs will increase.

On the other hand, program size can vary in the sense that the amount of a good per person provided by some program can vary. In the public-good and semi-public-good cases, the number of persons receiving benefits is fixed. The number of persons receiving benefits from a public good is fixed at the entire citizenry. The number of persons receiving benefits from a semi-public good is fixed at some number greater than one, but less than the entire citizenry. Since the number of persons receiving benefits from a public or semi-public good is fixed, program size can vary only in the sense that more benefits per person are transferred. That is, additions of more public or semi-public goods per person results in positive marginal costs.

Decisions regarding both the number of persons to be included in a program and the amount of a good to be provided per person are often made

simultaneously in the real world. Clarity will be enhanced by using a partial equilibrium approach. If program size, in the sense of goods per person, varies, then program size, in the sense of the number of persons included, will be considered constant. This will be true of the public and semi-public good cases. If program size, in the sense of persons included in the program, varies, then program size, in the sense of goods provided per person, will be constant. This is the private-goods case.[4]

The problem of determining budget size in the case of private goods will be one of determining the number of citizens that a democracy will include in a program that provides a fixed amount of private goods per person. The problem of determining budget size in the case of public and semi-public goods will be one of determining the amount of goods per person that will be provided to a fixed number of citizens. The analysis will assume a fixed number of citizens; no migration, either from or to the democracy, can occur.

The definition of "correct" budget size that follows is based on the compensation principle of J. R. Hicks and Nicholas Kaldor (20; 23). Social welfare will be increased as long as the citizens who lose from some reallocation of resources lose less than the "winners" gain. The "winners" could then compensate the "losers" for their losses and still

[4]Buchanan deals extensively with the qualitative variations that may occur in the provision of a public good (6, pp.49-65). He correctly points out that quality is an important variable reflected in what he calls the "mix" of public goods. These qualitative variables are important and a complete theory of budget size would include their consideration. For the less ambitious purposes of this paper, however, a given qualitative mix will be assumed in all cases and will not be considered a variable of the democratic process.

realize net benefits. Actual compensation is not required under this principle; the potential to compensate is sufficient.[5]

When the number of persons to be included in a program is the relevant variable -- the private-goods case -- the "correct" size of a program will be said to be that size where the addition of the last member (i) to a program yields more benefits (b) than it does costs (c). Further, the addition of the next potential member would yield greater costs than benefits. In other words, a game must be positive-sum for society as shown by Davis and Meyer (14, p. 11). That is,

$$1) \quad \sum_{i=1}^{F} b_i > \sum_{i=1}^{F} c_i \quad (i = 1, 2, \ldots, F),$$

where i is the $i^{th}$ member of a society of F members, $b_i$ is the benefit accruing to the $i^{th}$ member and $c_i$ indicates his costs. In addition, marginal benefits must be greater than or equal to marginal costs for the program:

$$2) \quad \sum_{i=1}^{F} b_{i,n} \geq \sum_{i=1}^{F} c_{i,n}; \quad \sum_{i=1}^{F} b_{i,n+1} < \sum_{i=1}^{F} c_{i,n+1},$$

where $b_{i,n}$ equals the additional benefits to the $i^{th}$ member of society from the addition of the $n^{th}$ member to the program and $c_{i,n}$ equals the costs; where $b_{i,n+1}$ equals the benefits to the $i^{th}$ member of society from

[5] Scitovsky demonstrated that this criterion may be inconsistent. A resource reallocation may satisfy the principle in one direction with the gainers gaining more than the losers lose. However, if a reallocation back to the original position occurs, the previous losers may gain more than the previous gainers lose (41).

the addition of the $n+1^{th}$ member and $c_{i,n+1}$ equals the costs. In other words, the sum of the benefits to the members of society of adding the $n^{th}$ member must be equal to or greater than the costs, and the sum of the benefits to society of adding the $n+1$ member must be less than the costs. Marginal costs to society from the inclusion of additional members are assumed to be increasing while marginal benefits are decreasing.

When the amount of the good or service per person is the relevant variable -- the public-good and semi-public-good cases -- the "correct" size of the budget will be said to be that size where the addition of the last unit of the good yields benefits equal to or greater than the costs to society from that addition. That is, a game must be positive-sum as in (1). In addition, marginal benefits must be equal to or greater than marginal costs. That is,

$$3) \quad \sum_{i=1}^{F} b_{i,q} \geq \sum_{i=1}^{F} c_{i,q} \quad \text{and} \quad \sum_{i=1}^{F} b_{i,q+1} < \sum_{i=1}^{F} c_{i,q+1} \ ,$$

where $b_{i,q}$ is the benefit accruing to individual i from the addition of the $q^{th}$ unit of the public good and $c_{i,q}$ is the cost; $b_{i,q+1}$ is the benefit to individual i that would result from the addition of the next potential unit of the public good and $c_{i,q+1}$ is the cost.

The definitions of "correct" program size in both the case where the number of persons varies and the case where the quantity per person varies ignore the distributional effects caused by the democratic process as it determines the amounts of various goods and services that government will provide. They imply that interpersonal utility comparisons are possible and also that each person's welfare contributes equally to social welfare in determining "correct" program size. This second assumption could be

relaxed or modified allowing the construction of various weighting schemes.[6]

What follows will also assume that there are no significant costs of agreement associated with attaining the various program sizes which are not included in the tax prices that the members of society must pay. Further, the tax structure is predetermined no one in which each member pays a proportional amount of the cost of each program irrespective of whether he shares in the benefits. The idea that the tax structure is predetermined is not unrealistic; however, the assumption of proportional tax prices is somewhat limiting. An examination of the effects on this model of varying the tax structure may prove useful at some future date.

## Budget Size

A coalition in a democracy has an incentive to add members only up to the point where it has a majority (33). It would seem an unlikely occurrence if the marginal conditions associated with the "correct" budget size were to be realized through the actions of some majority coalition seeking its own will and not that of society. Bribery is a complicating factor, however, and it may be that in some cases collective bribery may steer society closer to the "correct" program size. The

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[6] For example, Buchanan constructs a model that assumes a positive income elasticity of demand for public goods. He concludes that a tax-price schedule with an income elasticity that is "equal to, but opposite in sign (to) the income elasticity of demand for the public good divided by the relative price elasticity of demand for the public good" will lead to "full neutrality" (5, pp. 151-153). Full neutrality means that the price each citizen pays is equal to his marginal evaluation of the good. This model could be modified in a similar manner to reflect various concepts of what the social welfare function should be. This is not the purpose of this chapter, however, and it will be enough to analyze the performance of democracy under these rather limiting assumptions.

results of the democratic process as measured against the standard of "correct" program size will differ, with and without bribery, with the type of good being provided.

Private Goods

Private goods are usually provided in the market. Normally, there is no efficiency reason for government provision of private goods since the market will result in an optimal output. When government does undertake the provision of private goods or services, there are two possibilities: provision of the good may result in net benefits at some level, or there may be no level of provision which will result in net benefits.

This section will show that, even if there is some level where net benefits will occur, democracy will have a tendency to extend programs for private goods beyond the correct level. Reduced benefits or even negative benefits from the program may result. In addition, a democracy may provide private goods for which net benefits are negative at every level of provision. To the extent that democracy provides these kinds of goods and to the extent that it overprovides goods for which net benefits occur at some level, the budget in a democracy will be too large.

The first part of this section will discuss goods for which net benefits will result at some level of provision. When a program for private goods is extended, it means that more citizens receive some fixed amount of goods per person. The second part of this section will deal with goods for which there are no positive net benefits at any level. This is the kind of good which may benefit only a small group at the expense of society as a whole. A special quota on textiles sought by textile manufacturers might be an example of this kind of good.

Suppose a majority coalition $(\frac{P}{2} + 1)$ forms where P is the total population and k is the number in the coalition. The program contemplated is one where the inclusion of additional members would result in larger benefits than costs to society. The coalition has no incentive to add these members because it has already achieved a majority. If L is the last member whose inclusion would constitute a net benefit to society, thus:

$$4) \quad \sum_{j=k+1}^{L} \sum_{i=1}^{P} b_{ij} > \sum_{j=k+1}^{L} \sum_{i=1}^{P} c_{ij} \qquad \begin{bmatrix} i = 1, 2, \ldots, P \\ j = 1, 2, \ldots, P \end{bmatrix}$$

$$\sum_{i=1}^{P} b_{i,L} \geq \sum_{i=1}^{P} c_{i,L} \quad \text{and} \quad \sum_{i=1}^{P} b_{i,L+1} < \sum_{i=1}^{P} c_{i,L+1} \ ,$$

where $b_{ij}$ is the benefit to $i^{th}$ member of society from the inclusion of the $j^{th}$ member of the coalition in the program and where $c_{ij}$ is its cost; where $b_{i,L}$ is the benefit to the $i^{th}$ member of society from the inclusion of the $L^{th}$ member in the coalition and $c_{i,L}$ is its cost, where $b_{i,L+1}$ is the benefit to the $i^{th}$ member of society from the inclusion of the $(L+1)^{th}$ member in the coalition and $c_{i,L+1}$ is its cost. In other words, there are net benefits to society from extending the program to the $(L^{th})$ member and there are marginal benefits also. Therefore, L is the "correct" program size. The cost of including these members is

$$\sum_{j=k+1}^{L} \sum_{i=1}^{P} c_{ij}$$

and the program is too small by that amount.

If bribery is possible, however, each member from k to L will have an incentive to bribe the coalition to let him join. Since we are dealing with a private good, all of the benefits from the addition of a member

the coalition will accrue to that member. Since he gets all of the benefits and since it was shown above that these benefits are greater than the costs to society, each member up to L can afford to bribe the coalition to let him join and still realize a net gain. He can compensate the coalition members for their costs (under the fixed tax structure)[7] resulting from his inclusion and still be better off. Members from k to L will join and the program will be the "correct" size.

However, it is clear that under a general tax structure, independent of expenditure decisions, the costs to any coalition of less than 100 percent from the inclusion of an additional member will be less than the costs to society. This is because the coalition pays less than 100 percent of the costs. This means that potential members beyond L, the "correct" size, will derive benefits from their inclusion which are greater than the costs to the coalition. Their benefits will be less than the costs to society but greater than the costs to the coalition. They can bribe the coalition and still realize net benefits. Unfortunately, society will realize a net loss.

If the $N^{th}$ member is the last member whose inclusion will benefit him more than it will cost the coalition, then:

$$5a) \quad \sum_{j=L+1}^{N} \sum_{i=1}^{P} b_{ij} < \sum_{j=L+1}^{N} \sum_{i=1}^{P} a_{ij} \qquad \begin{bmatrix} i = 1, 2, \ldots, P \\ j = 1, 2, \ldots, P \end{bmatrix}$$

and

$$5b) \quad \sum_{i=1}^{P} b_{i,N} < \sum_{i=1}^{P} c_{i,N} \ ,$$

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[7] The tax structure is a general one. Each of the P members of society pays a proportion of total costs equal to $\frac{1}{P}$. This structure is not subject to variation with individual programs.

where $b_{ij}$ is the benefit to the $i^{th}$ member of society resulting from the inclusion of the $j^{th}$ member in the coalition and $c_{ij}$ is the cost, where $b_{i,N}$ is the benefit to the $i^{th}$ member of society from the $N^{th}$ member's inclusion in the coalition and $c_{i,N}$ is the cost. In other words, there is a net loss to society from the inclusion in the coalition of the $(L+1)^{th}$ through the $N^{th}$ members and a marginal loss for each member as well. However, if:

$$5e) \quad \sum_{j=L+1}^{N} \sum_{i=1}^{N} b_{ij} > \sum_{j=L+1}^{N} \sum_{i=1}^{N} c_{ij}$$

$$5f) \quad \sum_{i=1}^{N} b_{i,N} > \sum_{i=1}^{N} c_{i,N}$$

and

$$5g) \quad \sum_{i=1}^{N+1} b_{i,N+1} < \sum_{i=1}^{N+1} c_{i,N+1} ,$$

there are net benefits to the coalition from adding new members up to the $N^{th}$ member. He is the last member who will benefit enough from his inclusion to compensate the coalition for its costs.

The coalition benefits from the inclusion of members up to the $N^{th}$ member. However, society experiences a net loss on each member from L+1 to N. The program is too large by an amount equal to the costs of adding these members. The program exceeds the "correct" size by

$$\sum_{j=L+1}^{N} \sum_{i=1}^{P} c_{ij} .$$

Of course, those members of society not included in the majority coalition may have an incentive to bribe the coalition to restrict the membership. They will do so if the amount of the bribe is less than the net loss they

experience from adding members. If they do this, the budget is too large by the amount of this bribe.[8]

If private goods can be provided in a democracy, there will be a strong incentive for a majority coalition to form with the purpose of adopting measures that will provide them with private benefits while requiring all taxpayers to share the costs. "Majority tyranny" of this type can occur in our model without violating the requirements of "correct" program size only if the tyrants restrict membership to that number where the marginal costs to society from the last member's inclusion do not exceed marginal benefits. This would result in a transfer of benefits, but would not violate "correct" conditions. Unfortunately, as shown above, the coalition has a strong incentive to extend membership beyond this "correct" level to the point where marginal benefits to the coalition equal its marginal costs. The budget in a democracy will be too large by the amount required to finance this extension.

The situation described above is one in which the program could provide net benefits to society. Unfortunately, there is a tendency for the program to be extended beyond the optimum, resulting in society's accruing negative net benefits from the addition of the last several members to the program. A more serious result is possible. The program could be extended to so many members that negative net total benefits to society might result. That is, not only will marginal additions be damaging to society, but the program may be extended so far that any benefit to society from a more limited program will also be wiped out.

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[8] Davis and Meyer introduce a system of cash transfers through the budget. The minority may agree to a bribe through a budget transfer that will persuade the majority to either limit the membership or refrain from playing the game (14, p. 13).

Of potentially more serious consequence is the public provision of private goods for which there are no positive net benefits at any level. Their provision could be the result of a power play by a special interest group. Suppose a special interest group of k members exists. Government provision of some private good will yield net benefits to the coalition, $\sum_{i=1}^{k} b_i > \sum_{i=1}^{k} c_i$. But the provision of the good to the k coalition members results in negative net benefits to society, $\sum_{i=1}^{F} b_i < \sum_{i=1}^{F} c_i$. If the members of the coalition constitute a majority, the program will be instituted and the budget will be too large by $\sum_{i=1}^{F} c_i$.

If the members do not constitute a majority, there is still cause for concern. If the benefits to the k members, $\sum_{i=1}^{k} b_i$, are sufficient to bribe other members of society to vote for the provision of the good, the program will be instituted. This is the situation discussed by Davis and Meyer (14, p. 13). The budget will be too large by the total cost of such a program. It is conceivable that the program could do harm to society beyond the actual cost of the program. For example, the highway lobby might succeed in pushing through a bill that provides government support for the development of wider trucks. In addition to the costs to the citizens in tax monies, there will be additional costs associated with highway maintenance and reduced safety.

There may be private goods for which government provision will result in net benefits at some level. But a democracy will have a tendency to extend these programs too far. It may extend them so far that any benefits from a lower level of provision will be wiped out. In addition, a democracy may provide private goods for which there are no positive net benefits at any level of provision. The budget for private goods in a democracy will be too large.

Public Goods

Program size for a public good can vary only in the sense that benefits per person may vary. This is because a public good is, by definition, equally available to all. Recall the distinction between public and semi-public goods made earlier in this chapter. That is, the number of persons included in a program for a public good will remain constant at a level including the entire population. The number of persons included in a program for a semi-public good will remain constant at a level less than the entire population. The amount of the public good which is available to all members can vary, however. Therefore, the essential problem in determining the size of democratic programs for the provision of public goods is to determine the size of the program per person that must include all members of the democracy.

The level of provision of a public good that each member of a democracy would prefer is determined by the fixed proportion of the tax bill that he must pay and by his demand curve for the good. A person who knows what his marginal cost (tax price) will be for each level of provision will prefer the amount of the public good indicated by the intersection of his demand curve for the good and his known marginal cost curve. Under this model's assumption of equal marginal cost (tax price)

to all citizens, an individual's preferred amount of the public good will be determined exclusively by his demand curve as shown by Buchanan (5, p. 145). Figure 12 shows quantities of a public good preferred by three citizens. $D_1$ is individual 1's demand curve for the public good. With his known constant marginal cost, MC, he will prefer the amount indicated by the intersection of $D_1$ and MC. He will prefer $Q_1$. Similarly, $D_2$ will prefer $Q_2$, and $D_3$ will prefer $Q_3$.

Duncan Black has shown that with single peaked preferences the median individual's preferences will be adopted in a democracy (2, pp. 14-16). The quantity desired by the median individual will defeat any other quantity in an election. The median citizen's preference for a public good does not necessarily reflect the "correct" program size. The "correct" program size depends on the relative net benefits of his fellow citizens. The net benefit accruing from a marginal change is indicated by the vertical difference between an individual's demand curve and his marginal cost (tax price) curve for a good. The greater the difference between the two curves, the greater the change in net benefits an individual will experience from a marginal change in the quantity of the good. Figure 13 shows that "correct" program size is $Q_4$, where the marginal benefits to society, indicated by D total, equal its marginal costs. There is no reason why the "correct" program size, $Q_4$, should be equal to the one adopted in a democracy, $Q_2$, the median individual's preferred quantity.

If bribery is possible, however, there will be a tendency for the program to move toward the "correct" size. Assume that the preference of the median individual is for Q units of the public good. Citizens desiring more of the public good, as well as citizens desiring less,

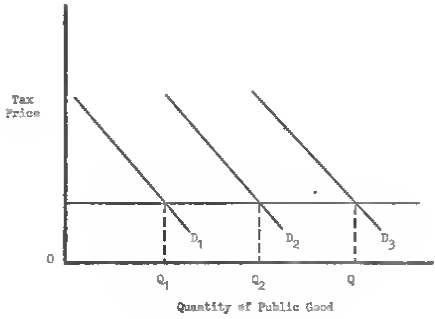


Figure 12.—Individual Preference for a Public Good

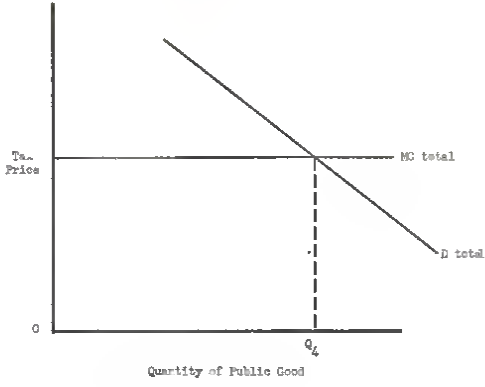


Figure 13.—The "Correct" Budget Size

have gains to be made from bribing the median individual to change his vote. The gains to be made from bribing the median individual are equal to the net benefits accruing to these individuals from some change in quantity. Total gains to be made by a group from a change in the quantity of a public good can be measured by subtracting the sum of marginal costs (tax price) from such a move from the sum of the marginal benefits. If those desiring more than Q will realize more net benefits from a move to their desired quantity than those desiring less, then

$$6)\left(\sum_{j=Q}^{n}\sum_{i=n+1}^{P} b_{ij} - \sum_{j=Q}^{e}\sum_{i=n+1}^{P} c_{ij}\right) > \left(\sum_{j=k}^{Q}\sum_{i=1}^{n-1} b_{ij} - \sum_{i=1}^{Q}\sum_{j=1}^{n-1} c_{ij}\right)$$

$$\begin{bmatrix} i = 1, 2, \ldots, P \\ j = 1, 2, \ldots, P \end{bmatrix}$$

where j equals the quantity of the public good, i is the individual citizen (from 1 to P in order of quantity desired), n is some quantity of the public good greater than Q, and k is some quantity smaller, e is the median citizen and Q is the quantity he prefers. Those desiring a larger quantity than Q have an incentive to bribe n to join them in voting for such quantity greater than Q. Similarly, those desiring a smaller quantity than Q have an incentive to bribe e to join them in voting for some quantity less than Q. In this situation, e is in control.

How much can he demand to move, say, to a larger quantity? Apparently, he could demand any amount up to and including that amount which the coalition desiring less than Q (citizens i = 1, 2, ..., e-1) would be willing to pay to prevent such a move. However, the amount he can demand is limited by the size of the bribe that the citizen desiring the next smallest quantity -- citizen n-1 -- would require to join the

majority. That is, his demands are limited by the amount that n-1 would require to abandon his group and join the coalition (i = n+1, n+2, ...,P). The bribe required to induce n to join is just less than that required by n-1, which is limited by the amount of the bribe required by n-2. Thus, the actual bribe is apt to be quite small.

As the quantity of a public good moves from some level less than individual i desires, say Q, toward his desired amount, X, he will experience an increase in net benefits equal to

$$\sum_{j=Q}^{X} b_{ij} - \sum_{j=Q}^{X} c_{ij} .$$

As the quantity of a public good moves from some level near an individual's desired amount toward some level of provision further removed from that which he desires, he will experience a decrease in net benefits equal to the same expression. As the majority coalition bargains on the actual amount that they will adopt, there is an incentive for those who experience positive net benefits from increases in the quantity of the public good to bribe those who experience negative net benefits. There is an incentive for this process to continue up to the point where positive net benefits realized by those desiring increases in the public good are no longer sufficient to bribe those realizing negative net benefits from those increases. At this point, the marginal benefits to the majority coalition resulting from the addition of the last unit of the public good are exactly equal to the marginal costs:

$$\sum_{i=n}^{P} b_{i,z} = \sum_{i=n}^{P} c_{i,z} .$$

At the z level of provision, marginal costs equal marginal benefits for the majority coalition.

More interestingly, individual members will also be at a point where their marginal costs are equal to their marginal benefits. That is, $b_{i,e} = c_{i,z}$. Members who desired an amount of the public good that was less than e were fully compensated for any net losses that occurred enroute to this "equilibrium" quantity. This compensation can be considered a reduction in marginal cost to the recipient. Therefore, individuals being compensated are in equilibrium in the sense that their marginal benefits at z are equal to their "effective" marginal costs -- tax price minus compensation.

Members who desired an amount of the public good that was greater than z would normally be experiencing marginal benefits in excess of marginal costs at this level. However, they have been compensating those desiring less than this quantity. In order to induce a further increase in quantity they are faced with providing further compensation. Their effective marginal costs are equal to the sum of the tax price and the compensation that they must pay members desiring lesser amounts. At the e "equilibrium" level their marginal benefits are equal to their "effective" marginal costs.

While the majority coalition is in equilibrium at the z level of provision, the minority coalition is not. Although the marginal conditions have been met for the majority coalition, they have been far exceeded for the minority as well as for the citizenry considered as a whole. That is:

$$7a) \quad \sum_{i=m}^{P} b_{i,e} = \sum_{i=z}^{P} c_{i,e}$$

but

$$7b) \quad \sum_{i=1}^{n-1} b_{i,z} < \sum_{i=1}^{n-1} c_{i,e}$$

and

$$7c) \quad \sum_{i=1}^{P} b_{i,z} < \sum_{i=1}^{P} c_{i,z} .$$

There is an incentive, however, for the minority coalition to bribe the majority to adopt a smaller quantity of the public good. This process can be looked on as a bargaining process between two coalitions with the benefits and costs of any change in the quantity of the public good being distributed by the coalition to its individual members. There will be an incentive for the majority to reduce the quantity of the public good that it adopts as long as the compensation it receives from the minority at least equals the net reduction in benefits that it experiences. By the same token the minority has an incentive to compensate the majority for changing the quantity of the public good up to the point where the net benefits that it experiences from a reduction in quantity equals the bribe required to induce that reduction. This will be at the point where marginal benefits to society equal marginal costs. That is,

$$8) \quad \sum_{i=1}^{P} b_{i,e} = \sum_{i=1}^{P} c_{i,e} ,$$

where e is the quantity of the public good finally determined in the bargaining process.

By a reasoning process similar to that used to show that individual members of the coalition were in "equilibrium" at z, it could be shown that at s all members of society are in "equilibrium." That is, "effective" marginal costs equal marginal benefits for each member of society at the s level of provision.

Discussions of public goods sooner or later find themselves confronted with the problem of revealed preference. The above analysis has ignored it, at least explicitly. The assumption was made that a proportional tax structure existed -- a structure unaffected by an individual's preference for the good. Since revealing his preference would not affect the proportion of the tax bill he would pay, an individual could best serve his own interest by revealing his preference through his vote. He would rationally vote for the amount indicated by the intersection of his tax price curve -- TC/P, where P is the number of taxpayers and TC is total cost -- and his demand curve for the public good.

When bribery was introduced, trade became possible. That is, one could trade his vote for a bribe or trade a bribe for a vote. This created an incentive for bargaining. Such bargaining would be in a direction from the original position towards the point where the sum of the marginal costs equals the sum of the marginal benefits. A move in the other direction would be unlikely since net benefits would be less than net costs from such a move.

Unfortunately, the introduction of bribery also introduced the incentive for an individual to conceal his preferences. That is, the possibility arises that one might vary the amount of the bribe he must give or receive if he conceals his true preferences. In a small group, an

individual could act strategically in an attempt to encourage others to provide the required bribe or to encourage them to provide a bribe larger than the minimum he would accept. In large groups, each might feel that his contribution would have a negligible effect on the outcome and, therefore, misrepresent his preferences. The result is that incentives to conceal preferences by individuals might overcome the group incentive to reap mutual gains from the trading of votes for bribes. There is no way to be sure what the exact outcome of such a process will be. The point is that there will be a strong tendency to move toward the "correct" budget size. If the median individual happens to desire the "correct" amount, then at least there will be a tendency to remain at that point. The net benefits from a move away from this point will be exceeded by net losses. If the median individual desires some amount other than the "correct" one, there is an incentive for society to move toward the "correct" size. The introduction of concealed preferences into the model precludes the possibility of giving a determinate answer. The best that can be said is that the primary incentive in a democracy is to reach the "correct" budget size in the case of public goods.

Semi-Public Goods

Recall that Samuelson's 1966 paper recommended a new definition of a public good. A public good should be defined as one that enters two or more persons' utility functions. Further, there is a "knife edge" that separates pure private goods — possibly including some very-nearly-pure private goods — and the world of public goods. Most goods can be described as public goods in the new Samuelsonian sense. A distinction was made above between public goods, which enter all utility functions, and

semi-public goods, which enter more than one, but less than all, utility functions.

It is clear that the varieties of these semi-public goods are virtually endless. This paper assumes that the essence of these goods is that they enter two or more persons' utility functions. They differ from public goods only because they do not enter all utility functions. Publicness is not only a characteristic, but it is also the essential characteristic. The number of persons who benefit from the good is fixed at less than the entire population.[9]

It was shown in the section on public goods that a democracy has a tendency to provide these goods at the "correct" level. With a semi-public good, when less than the whole citizenry are beneficiaries, the same tendency does not exist. A democracy has a tendency to overprovide semi-public goods. In the case of a pure public good, a citizen prefers that his government provide that amount indicated by the intersection of his demand curve and his marginal cost curve or tax price $-\frac{TC}{P}$ with the assumption that each citizen pays an equal portion of the tax bill. The same is true of semi-public goods. The difference between public goods and semi-public goods, however, is that less than 100 percent of the citizens receive benefits from a semi-public good.

Assume a minority of the citizens desires a semi-public good. This good may or may not provide net benefits to society at various levels of provision. The minority is comprised of all members of society who

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[9]One difficulty is that in the real world the number of beneficiaries may not be fixed. The population that benefits from a highway may fluctuate. Nevertheless, when a vote is taken on a proposal for a new highway, the number of citizens who perceive themselves as beneficiaries is fixed.

benefit from the good -- all those whose utility functions the good enters. The "correct" budget would require that the good be provided at the level where the marginal benefits to society equal the marginal costs. Without bribery, none of the good will be provided since only a minority advocates its provision. If the good in question provides net benefits to society, the budget will be too small.

A member of the minority will prefer the amount of the semi-public good indicated by the intersection of his demand curve for the good and his own marginal cost curve. His marginal cost curve is equal to $\frac{TC}{P}$, where TC equals the total cost and P equals the number of citizens in the democracy. If bribery is permitted, the minority coalition will have an incentive to bribe other citizens to join them in voting for provision of the semi-public good. The "correct" provision of the good would require a quantity such that

$$\sum_{i=1}^{P} b_{i,Q_1} = \sum_{i=1}^{P} c_{i,Q_1} ,$$

where $Q_1$ is the amount of the semi-public good, that is, where the marginal benefits to society equal the marginal costs. The minority would desire provision to the level at which

$$\sum_{i=1}^{K} b_{i,Q_2} = \sum_{i=1}^{K} c_{i,Q_2} ,$$

where K is the number in the minority and where $Q_2$ is the amount of the semi-public good — in other words, where the marginal benefits to the coalition equal its marginal costs. Since, under the assumption of equal taxation, the minority will pay only a portion of the costs proportionate to their membership and since they receive 100 percent of the benefits

from the good, the second expression will result in a higher level of provision than will the first. That is, $Q_2$, the minority's desired level of provision, will be greater than $Q_1$, the "correct" level.

If K is the number of members in the minority coalition and if M is a bare majority ($\frac{P}{2} + 1$), then the coalition must bribe N-K citizens to vote with the coalition. The amount of the bribe must be at least equal to the tax costs of those bribed in order to induce them to vote favorably. This will change the amount of the good desired by the coalition.

If each member is required to pay an equal share of the bribe, then his new marginal cost curve is given by $\frac{TC}{K} \cdot \frac{N}{P}$. Since the N-K members of the majority who do not benefit must be at least compensated for their tax losses, each member of the minority of K members must pay $\frac{1}{K^{th}}$ of the majority's share of total costs. This marginal cost curve is higher than a minority member's original curve, $\frac{TC}{P}$, and, therefore, will be equal to his marginal benefits at a lower level of provision than $Q_2$. Call this new level $Q_3$. The amount of the semi-public good desired by the coalition when bribery costs are included will be

$$\sum_{i=1}^{N} b_{i,Q_3} = \sum_{i=1}^{N} c_{i,Q_3} .$$

That is, the coalition will desire that amount where the marginal benefits to the minority coalition -- and, therefore, to the majority coalition and to the entire citizenry -- equals the marginal costs to the majority coalition -- and, therefore, also the minority coalition. The $Q_3$ quantity is a smaller amount than that desired by the minority, $Q_2$, if it did not have to pay bribery costs, but it is still a larger level of provision than is "correct," $Q_1$. The quantity $Q_1$, which costs

$$\sum_{j=1}^{Q_1} \sum_{i=1}^{P} c_{ij} ,$$

is the "correct" size. The quantity $Q_3$, which costs

$$\sum_{j=1}^{Q_3} \sum_{i=1}^{P} c_{ij} ,$$

is the actual level of provision. The total cost of $Q_3$,

$$\sum_{j=1}^{Q_3} \sum_{i=1}^{P} c_{ij} ,$$

exceeds

$$\sum_{j=1}^{Q_1} \sum_{i=1}^{P} c_{ij}$$

by

$$\sum_{j=Q_1+1}^{Q_3} \sum_{i=1}^{P} c_{ij} ,$$

and the budget is too large by that amount.

Suppose now that a semi-public good exists that provides benefits to an exact majority of the citizens. If this were the case, there would be no need to bribe additional citizens to vote for the good since the required majority already desires its provision. Marginal cost to an individual will be $\frac{TC}{P}$ since no bribery costs are involved. Individual coalition members will desire that amount of the good indicated by the intersection of this marginal cost curve and their own demand curves for the good. Again, as shown in the section on pure public goods, the

majority will have an incentive to advocate the amount of the semi-public good indicated by the intersection of majority marginal costs and majority marginal benefits -- also society marginal benefits. Consequently, they will vote to provide that amount. As in the case where a minority received benefits from a semi-public good, when an exact majority benefits, the good will be provided at a level where marginal benefits to society equal marginal costs to the coalition. That is, the good will be provided at the level for which

$$\sum_{i=1}^{P} b_{i,Q_3} = \sum_{i=1}^{N} c_{i,Q_3} ,$$

where $Q_3$ is the majority's desired level of provision and N is the majority coalition. The "correct" provision would be at the level for which

$$\sum_{i=1}^{P} b_{i,Q_1} = \sum_{i=1}^{P} c_{i,Q_1} .$$

The quantity, $Q_3$, is a larger level of provision than $Q_1$, the "correct" level. The amount, $Q_1$, which costs

$$\sum_{j=1}^{Q_1} \sum_{i=1}^{P} c_{ij} ,$$

is the "correct" size. The amount, $Q_3$, which costs

$$\sum_{j=1}^{Q_3} \sum_{i=1}^{P} c_{ij} ,$$

is the actual level of provision. The cost of $Q_3$,

$$\sum_{j=1}^{Q_3} \sum_{i=1}^{P} c_{ij} ,$$

exceeds the correct cost,

$$\sum_{j=1}^{Q_1} \sum_{i=1}^{P} c_{1j} \ ,$$

by

$$\sum_{j=Q+1}^{Q_3} \sum_{i=1}^{P} c_{ij} \ ,$$

and the budget is too large by that amount.

When a majority less than P, the entire citizenry, and greater than N, a $(\frac{P}{2} + 1)$ majority, benefits from the provision of a semi-public good, the results are similar. This majority between N and P, call it Q, would again determine its desired level of provision by a process similar to that shown in the section on public goods. Again, the level chosen will be where the marginal benefits to the coalition -- and so to society -- equal marginal costs to the coalition. Since the coalition's costs are less than those of society and since its benefits are the same, that level will again be too large. Clarity would not be served by wading through the notation again.

One thing should be pointed out regarding the number of citizens who benefit from a semi-public good relative to the size of the citizenry. The level of provision for a semi-public good will always be too large as long as less than the entire population benefits from the good. The larger the percentage of citizens that benefit from a good the closer will the actual level of provision be to the "correct" level. This is because the coalition has no incentive to provide the good at a level where marginal benefits to the coalition equal marginal costs. As the

coalition approaches 100 percent of the citizenry, marginal costs to the coalition approach marginal costs to society. As a coalition departs further and further from 100 percent of the citizenry, marginal costs to society become greater and greater than marginal costs to the coalition.

This phenomenon provides a rationale for the idea that governmental services should be provided on a functional basis. A flood control district is an example of a good provided on such a functional basis. If flood control is to be provided at the "correct" level, not only should a single flood control authority have control over the flood area, but also the citizenry of that same area should bear the full costs and should determine the amount of that flood control (30, pp. 3-21).

The budget for semi-public goods will be too large in a democracy. Since this is the most common type of good according to Samuelson, this overprovision is a serious problem. Not only will programs that should be instituted be extended too far, but also programs that should not be instituted at any level may find their way into the budget.

## Some Final Thoughts

The budget in a democracy will be too large. Some private goods provide net benefits at some level of provision, but programs for these goods will be too large in a democracy. Programs for some private goods which a democracy will provide do not yield net benefits at any level. These are usually associated with special interest groups. There is a tendency for the provision of pure public goods to be "correct." There are relatively few types of goods that would fit this category, however. Semi-public goods will always be provided at a level which is too high. Since most goods fall in this category, this is a serious result.

The limits of this analysis are indicated by some of the restrictive assumptions employed. Taxes are seldom strictly proportional to the size of the budget. More commonly, a host of different taxes face the citizen. He is likely to be pathetically ignorant of the actual costs to him of a government program. Moreover, he must vote for representatives of parties whose budget policies are, at best, vague in terms of costs and benefits. The citizen does not usually enjoy the luxury of voting for specific programs, except in the case of rare referendums. The process of collective bribery described above could only take place in a truly small democracy. More realistically, bribery would take place in the form of vote trading, or logrolling, among representatives in response to pressures from special interest groups.

Nevertheless, the strong tendency for an excessive budget to emerge is alarming. Budgets continue to grow at all levels of government. Decisions that once were private increasingly are delegated to public decision. Zoning and planning commissions, as well as other forms of regulation, become more common. As the scope of government activity continues to grow, increased concern for the allocative effects of this activity is indicated.

## CHAPTER 5

## OTHER VIEWS ON THE PUBLIC SUPPLY OF PUBLIC GOODS

The central conclusion of Chapter 4 is that the budget in a democracy is too large. It is too large because of the tendency of a democracy to institute programs that result in negative total benefits and to extend programs with positive benefits beyond the point where positive marginal benefits occur. The best known proponents of the opposite view -- that the budget in a democracy is too small -- are J. K. Galbraith and Anthony Downs (18; 16).

Downs concludes that the budget will be too small because of biased rational ignorance on the part of the electorate. Citizens are more ignorant of benefits than of costs. Because they are more ignorant of benefits than of costs, citizens will vote for parties with budget policies that exclude some programs that would provide net benefits (16, p. 79). Galbraith argues that the budget will be too small because of the "dependence" effect. The production process causes the creation in consumers of new wants for private goods. These new wants are less urgent than original wants because they are created by the process that is supposed to satisfy wants (18, pp. 251-269). These less important wants lead democracy to overprovide private goods at the expense of social goods.

Both Downs and Galbraith reach their conclusions using significantly different concepts of what is "correct" than the one presented in

Chapter 4.[1] Since the standards of "correctness" upon which they are based differ, their similar conclusions — that the budget is too small — take on different meanings. What follows will analyze these different concepts of "correctness," as well as the different meanings of their conclusions. In addition to analyzing the meaning of these conclusions, the conclusions, themselves, will be examined. It will be found that, even in terms of their own concepts of "correctness," it is not clear that the Galbraith and Downs results follow; even accepting their respective concepts of what is correct, it is not apparent that the budget in a democracy will be too small.

## The "Correct" Budget

Davis and Meyer (14) measure the performance of democracy against the standard that positive-sum, and only positive-sum, games should be played. Chapter 4 extends their model to include the criterion that such games (programs) should be extended to the point where marginal costs equal marginal benefits. The analysis assumes increasing marginal costs and decreasing marginal benefits from the extension of a government program. This is a welfare approach based on the Hicks-Kaldor "compensation principle" (20; 23). Essentially, this principle means that the welfare of society is increased by actions which provide positive net benefits. When individuals who realize positive net benefits from some action gain enough to compensate those who realize negative net benefits, society is better off. It is not necessary that such compensation occur. If compensation is possible, the principle is satisfied.

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[1] Galbraith does not explicitly define his concept of "correct." However, implicit in his discussion is a notion of what that definition should be.

This approach assumes that interpersonal utility comparisons are possible. Received economic theory holds such comparisons suspect. The more popular Pareto criteria are intended to avoid such comparisons. The problem with the Pareto criteria is that they preclude the establishment of a "correct" budget because there would be an infinity of equally acceptable budgets. Using a Pareto approach, a "correct" budget could only be arrived at by resorting to a social welfare function. Any social welfare function must in the end resort to interpersonal utility comparisons.

In addition to assuming that interpersonal utility comparisons are possible, Chapter 4's approach ignores the distributional effects of government programs. Not only are one individual's benefits comparable to another's, they are also considered equal as far as the "correct" budget is concerned. No attempt is made to discriminate between individuals according to income or any other measure of total welfare. It is as good for a millionaire to accrue some increment of benefit as it is for a ghetto dweller to accrue the same increment.

Granting these shortcomings, the Davis and Meyer definitions and Chapter 4's extension provide criteria with which to compare alternative budgets. For example, the budget emerging from a pure democracy can be compared with the one emerging from some type of representative government. The criteria for "correctness" are independent of the system being judged. Various budgets can be judged by their effect on the "total welfare" of a society's citizens.

The Downs Concept of Correctness

Anthony Downs views the "correct" budget as "the one that would emerge from the democratic process if both citizens and parties had

perfect information about both actual and potential government policies. Insofar as an actual budget deviates from the 'correct' budget it is 'incorrect' " (16, p. 80). Further, the definitions of "correct" and "incorrect" "presuppose that it is good for the citizens of a democracy to get what they want, and to base their wants on as much information as possible. It is not good for them to get something they would not want if they knew more about it" (16, p. 80).

Downs apparently means that the "correct" budget is the one favored by the majority of citizens when they have perfect information. This budget is "correct" precisely because it is favored by a majority of citizens. It is "correct" in itself. There is no appeal to higher ethical authority. The results of perfect information in a representative democracy are good. In fairness, Downs may mean that the budget voted by citizens enjoying perfect information will, in fact, result in maximum benefits. Part of his hypothesis is that parties set budget policies to maximize support and that citizens vote for the parties whose policies benefit them the most. It could be that Downs believes that this will result in maximum benefits. He does not state this belief.

If Downs believes that maximum benefits will result when citizens vote for the party that benefits them most, he does not demonstrate this. The results in Chapter 4 would seem to dispute such a conclusion; however, the analysis in Chapter 4 assumed there were no parties. It would seem incumbent on Downs to demonstrate how a representative government would maximize benefits if this is his meaning.

If it is Downs' intention that the budget that emerges from a perfect information democracy is "correct," regardless of the welfare results, then it would seem necessary for him to justify the playing of

negative-sum games as pointed out by Davis and Meyer (14, p. 15). Further, such a definition provides no basis for comparisons of alternative systems. The budget of real-world, representative government is judged too small when compared to the standard of an ideal-world, perfect-information, representative government. There is no basis for comparing the budget results of democracy with the budget results of representative government.

Downs' conclusion that the budget in a democracy is too small seems to mean only that it is smaller than the one that would result if all citizens possessed perfect information. Chapter 4 concludes that the budget is too large because maximum benefits would be realized with a smaller budget. Downs compares the results of real-world democracy with the results of an ideal-world democracy. Chapter 4 compares the benefits resulting from an ideal-world democracy with the maximum benefits that a budget could provide. Chapter 4 asks if the budget in an ideal-world democracy is "correct." Downs assumes that it is and then proceeds to evaluate the performance of real-world democracy using the ideal-world budget as the standard.

The Galbraith Concept of Correctness

J. K. Galbraith argues that a "social imbalance" exists in that democracy has a tendency to provide too many private goods and not enough social goods (15, pp. 251-268). While admitting that the problem of providing social goods is, to a large degree, a technical one -- the problem of revealed preferences -- he goes one step further. He argues that, even if the relative wants of citizens for private and public goods could be technically determined and provided for, the "dependence effect" would

cause the private sector to be overprovided relative to the public sector (18, p. 261).

The production of private goods for the satisfaction of private wants creates more wants via the vehicles of advertising and emulation. Advertising creates wants that previously did not exist as does the consumption by one's neighbors of goods currently produced.[2] These wants, created by advertising and emulation, are not as urgent as other wants. They are not as important as "original" wants since they are "dependent" upon the process that is supposed to satisfy wants (18, pp. 158-159).[3] Galbraith makes no recommendation as to what the test of social balance should be. He argues that no such test can be made. In fact, he maintains that a "precise equilibrium is not very important" since an affluent society can afford considerable error (18,pp. 320-321).

Galbraith does not define the "correct" budget explicitly. However, the reason the budget is too small is that the dependence effect creates less urgent wants for private goods in the citizenry. Government provides a rough balance between private wants and social wants, but many private wants are unimportant. Thus, the balance that is struck is between urgent social wants, on the one hand, and a mixture of urgent and nonurgent private wants on the other. Therefore, the budget for the wants that are purely urgent -- social wants -- will be too small. Implicit in this analysis is the notion that the "correct" budget would strike at least a

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[2]Katona offers evidence that the main effect of advertising is to cause the abandonment of one private good in favor of another (24, pp. 55-61). Galbraith's hypothesis is that advertising causes a shift in preferences in favor of private goods at the expense of social goods.

[3]Hayek argues that it does not follow from the fact that they are contrived that wants created by advertising and emulation are less important than wants that require no stimuli. He contends there are very few wants besides food, clothing,and shelter that are original (19).

rough balance between urgent social wants and urgent private wants. The "correct" budget is one that "correctly" reflects the urgent desires of citizens.

Chapter 4's notion of correctness implies that society should maximize benefits in terms of all its desires — urgent and nonurgent. Galbraith implies that the budget should reflect only urgent desires. A budget that is "correct" in terms of Chapter 4's definition would be too large for Galbraith because many of the desires that it fulfilled would, themselves, be "incorrect" in his view.

The problem with such a notion of "correctness" is that it is not clear just what is meant by urgent desires. Galbraith implies that the test of urgency is whether a desire has been created. Desires that are created are not as urgent as original desires. It is not clear, though, whether all urgent desires are of equal urgency or, for that matter, whether all nonurgent desires are of equal nonurgency.

Theoretically, competing systems could be evaluated in terms of Galbraith's implied notion of "correctness." A representative government's performance in providing a budget that correctly reflects its citizens' urgent desires could be compared with the performance of a pure democracy in providing a similar budget. The difficulty would lie, even on a theoretical level, in identifying those desires that are urgent and the degree of their urgency.

## Budget Size

In terms of their respective criteria for "correctness," both Downs and Galbraith conclude that the budget will be too small. Downs maintains that there is a bias in the ignorance of the electorate. Citizens are

more ignorant of the benefits than of the costs of certain programs. This causes them to vote for budgets that exclude some programs that might benefit them. Galbraith contends that, since citizens have desires for private goods that are less urgent than their desires for social goods, government will provide too few social goods. Neither of these results necessarily follows from the definitions of correctness upon which it is based.

The Downs Budget

Downs argues that some ignorance on the part of citizens is rational. The cost of obtaining information may be greater than the benefits to be obtained from such knowledge would warrant. However, there is a bias in the ignorance of citizens. Benefits from many government programs are more remote than their costs. These benefits are often uncertain (16, pp. 87-93). The remoteness and uncertainty of benefits from government programs relative to costs lead citizens to be more ignorant of the benefits from these programs than of the costs. Accordingly, they may vote for budgets which exclude programs that would provide them with net benefits (16, p. 79).

Davis and Meyer dispute this result. They conclude that "the major effect of differences in knowledge about the net benefits attributable to different programs would appear to be on the amount of variance of estimates around those that would prevail given perfect information" (14, p. 14). There is no apparent reason why the estimates should be biased upwards or downwards. If there is no upward or downward bias in estimates of costs and benefits by the electorate there is no reason to suppose that the budget will be too small using Downs' standard of "correctness."

The Galbraith Budget

Galbraith contends that the conventional wisdom that in a democracy a rough balance will be struck between enjoyments from private goods and those from public goods is incorrect. This conventional view depends on the consumer making a choice, based on independently determined desires, between private and public wants.[4] "But given the dependence effect -- given that consumer wants are created by the process by which they are satisfied -- the consumer makes no such choice!" (18, pp. 260-261) Advertising and emulation operate primarily on behalf of private goods, causing consumers to make choices biased towards these goods.

Accepting the Galbraith view that the "correct" budget should reflect a balance between "urgent" private wants and "urgent" public wants, it does not necessarily follow that the budget will be too small. Chapter 4 demonstrated that, in terms of citizens' desires, the budget in a democracy will be too large. This disputes the conventional wisdom that Galbraith sanctions.

Assume that the desires of the citizens in a democracy have not been distorted by the effects of advertising and emulation. This would leave the electorate with desires for both public and private goods which are all urgent. They are urgent in the Galbraith sense that they have not been created by the process intended to satisfy them. Chapter 4 has shown that the democratic process will result in a government budget that is too large. If all desires are urgent, then the budget will be too large in terms of citizens' urgent wants.

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[4] It is not clear that the conventional wisdom depends on the consumer making a choice based on independently determined wants. This is Galbraith's interpretation of the conventional wisdom.

Now assume that advertising and emulation take place in the private sector. In addition to their urgent desires, citizens will now have less important desires for private goods and services. This will result in an increased supply of private goods relative to public goods. But this increased supply of private goods falls on top of a supply that was previously inadequate in terms of urgent wants. There is no apparent reason to suspect that the increased supply of private goods and services will result in an oversupply of these goods. It is necessary to know something of the magnitude of the effect of advertising and emulation on the supply of private goods in order to reach this conclusion. If the magnitude is not large, private goods may still be undersupplied. In this case, the government budget will still be too large. It is possible that the creation of these less urgent wants for private goods and services may call forth just the right amount of private goods to make up for their previous deficiency. In this case, advertising and emulation would be responsible for the establishment of the "correct" budget. It is also possible that advertising and emulation will call forth too many additional private wants. When added to urgent private wants, they may result in a budget that is too large. The dependence effect may cause the budget to be too small, too large, or "correct" in the Galbraith sense.

## CHAPTER 6

## SUMMARY AND CONCLUSIONS

This study considered two methods of public-goods supply. It is widely held that the supply of public goods will be suboptimal when they are provided in private markets. Suboptimal supply is a result of the simultaneous-consumption characteristic of public goods and the related problem of concealed preferences. A model was developed to examine the supply of public goods in private markets when consumers act independently. In contrast, there is little consensus concerning the level of public-goods supply when government is the vehicle for their provision. The level of provision depends on the mechanism of collective choice that society has elected to employ. A model was developed to examine the level of public-goods supply that will emerge from a pure democracy.

### Summary of the Analysis

In order to understand the behavior of individuals who are faced with a private market for public goods, it was necessary to examine their preference maps. Independent demand curves do not reflect the effect of one individual's purchases of a public good on the purchases of others. When one consumer purchases a public good, there is an income effect on other consumers whose utility function the good enters. A consumer will have a different demand curve for a public good for each quantity of the good purchased by other relevant consumers. This study termed these conditional demand curves, partial individual net demand curves. Partial

individual net demand curves, dependent on the purchases of all other relevant consumers, can be derived for each consumer. But it is not enough to know the conditional responses of individual consumers. In order to determine the supply of public goods, it is necessary to know the result of the interaction of these conditional responses. The partial net demand curves of two consumers were examined simultaneously and a locus of equilibrium quantities, one for each potential price, was derived. From this locus of equilibrium quantities, a price-quantity relationship was developed which was called an individual net demand curve. Since consumers are assumed to act independently, net total demand is the horizontal sum of the individual net demand curves. Net total demand reflects the total quantities of public good that consumers will purchase acting independently.

Independent total demand is the vertical sum of individual independent demand curves. Net total demand intersects independent total demand at one point. To the left of this point, independent total demand lies above net total demand. To the right of this point, the reverse is true. Efficiency requires that a public good be provided at the level where independent total demand is equal to marginal cost, or price, in competitive markets. There is only one price which will result in the optimal supply of a public good. Higher prices will result in a suboptimal supply, while lower prices will result in oversupply.

No determinate answer can be given about the level of the supply of public goods. They may be underprovided, overprovided, or optimally provided depending upon the price and upon the preference maps of the relevant individuals. The introduction of concealed preferences did not alter these results. At a given price, however, concealed preferences will

result in a lower level of supply than will occur if true preferences are revealed. It seems likely that many public goods, especially those with relatively high prices, will be provided suboptimally when consumers act independently, but it is possible that they will be overprovided or even optimally provided. Concealed preferences will aggravate the tendency for public goods to be undersupplied.

The study of the collective provision of public goods requires a different approach. Just as the competitive assumptions usually invoked for the study of private markets are necessary, so was it necessary to make restrictive institutional assumptions to facilitate the examination of the supply of public goods in a democracy. A pure democracy was postulated. There are no parties, no legislatures, no limits on the number or types of votes that may be taken. A strictly proportional tax structure was assumed. Complete and unrestricted bribery was allowed and no significant costs of agreement were considered. The "correct" budget was defined in terms of the net benefits that accrue to the citizens of a democracy from various programs. Only programs that yield positive net benefits should be instituted. These programs should not be extended beyond the point where positive marginal benefits are realized. This notion of "correctness" ignores the distributional effects of government programs.

The budgets for three types of goods — private goods, public goods, and semi-public goods — were examined. The budget for private goods was found to be too large. Coalitions will extend programs for private goods beyond the point where net benefits are realized by society. Coalitions extend programs too far because they maximize their own benefits when a program is extended beyond the point where society realizes positive

marginal benefits. The budget for semi-public goods will be too large for the same reason. In contrast, public goods will be provided at the "correct" level. This is because the benefits of public goods extend to all members of society. Since the budgets for private goods and semi-public goods will be too large and since the budget for public goods will be "correct," the total budget in a democracy will be too large.

## Conclusions

This study has demonstrated that private markets will result in a supply of public goods that is greater than optimal, less than optimal, or optimal, depending upon the price of the good and upon the preferences maps of the relevant individuals. Given the preferences of consumers, the level of supply will depend upon the price of the public good. The higher the price, the more likely it will be that underprovision will occur. Goods with considerable indivisibilities of supply — for example, public defense — will likely be provided at a suboptimal level. Goods characterized by significant indivisibilities should probably be provided through some other institutional arrangement. A private club is one such arrangement; democracy is another.

But, if democracy is the mechanism that society entrusts to make decisions about public goods, it is likely that they will be oversupplied. Most public goods provide less than general benefits.[1] Coalitions will extend programs for these goods too far. Society faces a dilemma. When public goods are provided independently, they will be undersupplied. When they are provided by government, they will be oversupplied. Perhaps

[1]Here, public goods refers to both public goods and semi-public goods in the terminology of Chapter 4.

Samuelson is right and nihilism about economics is indicated. There is no market algorithm that will guarantee efficiency in the supply of public goods. Democracy can apparently do no better.

But the conclusions reached in this study are tentative. The model of democratic action presented in Chapter 4 was a restrictive one. It is a first step towards analysis of budget size in the real world. It must be extended to consider the costs of information, the effects of parties and legislatures, and the consequences of more realistic tax schemes. It should be broadened to allow the analysis of federalism. Extensions of this kind, in the direction of the real world, may yield very different results.

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